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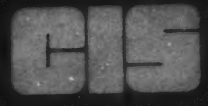

AIR FORCE NATIONAL PROGRAMS

HEARING

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

SECOND SESSION

SPECIAL HEARING

Congressional Witnesses
Department of Defense
General Accounting Office

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AIR FORCE NATIONAL PROGRAMS

THURSDAY, JUNE 24, 1982

U.S. SENATE,
SUBCOMMITTEE ON MILITARY CONSTRUCTION,
COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 9:30 a.m., in room 1223, Dirksen Senate Office Building, Hon. Paul Laxalt (chairman) presiding.

Present: Senators Laxalt and Mattingly.

CONGRESSIONAL WITNESSES

OPENING STATEMENT OF SENATOR LAXALT

Senator LAXALT. The subcommittee will come to order.

Congressman Kramer, I understand, is on the way. I think, ahead of that, perhaps I will make some initial observations.

Today's hearing will focus on the so-called national programs which are constructed and operated by the Air Force. I speak of the deployment of the MX missile system, the continuing construction in support of the Space Shuttle, the Aeropropulsion Systems Test Facility at Arnold Engineering and Test Center in Tennessee, and, last, the proposed Consolidated Space Operations Center, CSOC, in Colorado.

The subcommittee will consider a request of $425 million to support the four programs I have mentioned which represents about 20 percent of the overall Air Force fiscal year 1983 military construction budget.

PROJECT COST BREAKDOWNS

We have asked the Air Force to present testimony today on these programs because of their significance not only in cost but also in view of the fact that each project has been the focus of some controversy.

The MX, as you all are aware, continues to be a controversial system in its deployment mode. I understand that the so-called dense pack mode is the latest deployment method to be considered. I believe that the subcommittee needs to know the most current information on MX as it applies to the $207 million budget request for MX construction.

The Space Shuttle facilities at Vandenberg are continuing, with an $82 million request for fiscal year 1983 adding to the $300 million already invested.

For Arnold Engineering we have a $42 million request to complete the Aeropropulsion Systems Test Facility, after a multiyear construction period and a sizable cost growth.

The Consolidated Space Operations Center, CSOC, is being requested in fiscal year 1983, at $67.7 million. This facility came under fire last year because of the concern over the proposed Colorado site. Report language in our report and in the conference report on the fiscal year 1982 appropriation for military construction asked the Air Force to delay obligation of design funds for this project until the requested GAO report had been completed. Obviously, this report has been completed and we must now decide if design should proceed on this project.

I am hopeful that this hearing will clearly describe the importance of this facility and prove the justification to continue design above the current 60 percent level. It is my understanding that the Air Force and the Defense Department regard this as a vital segment of our defense space program.

INTRODUCTION OF WITNESSES

Sitting with the subcommittee today is my distinguished colleague from New Mexico, Senator Schmitt. I know that everyone present is keenly aware of his interest and knowledge regarding space.

We are also pleased to have with us Congressman Ken Kramer of Colorado, who will testify on the CSOC facility. Congressman Kramer has recently taken the lead on space issues before the House Armed Services Committee.

Also present to give testimony is the Honorable Edward C. Aldridge, Jr., Under Secretary of the Air Force; Maj. Gen. Clifton D. Wright, Deputy Director for Air Force Engineering and Services; and Mr. Walton H. Sheley, Jr., Director of the Mission Analysis and Systems Acquisition Division at the General Accounting Office.

Let me say that it is our intention to hold this hearing in open session; however, if the Air Force feels that in order to provide the subcommittee with the information and justification needed for us to understand the projects before us, I will move to go into executive session and clear the room of all but the appropriate persons.

We shall begin our hearing with Congressman Kramer, followed by General Wright, who will provide us an overview of the four projects from the engineering viewpoint. We will then hear from Secretary Aldridge and Mr. Sheley, whose prime interest is the CSOC facility.

I know that Senator Schmitt has some remarks and questions on CSOC. At this point Senator Schmitt will give his remarks and then we can move on to Congressman Kramer and the other witnesses.

I think that we should try to keep all remarks to only the most important areas and we can put any backup documentation in the record.

Senator Schmitt, would you proceed.

STATEMENT OF HON. HARRISON SCHMITT, U.S. SNEATOR FROM NEW MEXICO

CONSOLIDATED SPACE OPERATIONS CENTER PLANNING

Senator SCHMITT. I want to thank you, first of all, for allowing me to join you today to receive this testimony. All of it is of interest to me and particularly, as you indicated, I am concerned about the Consolidated Space Operations Center planning.

Planning is what the Air Force witnesses have come to discuss. Planning is the strength of an engineer's projections; it is the basis of an executive's policy; it is the mechanism upon which all consensus is built; it is the fundamental first step for all successful endeavors.

I asked to join you today, Mr. Chairman, because of my concern for an Air Force endeavor which lacks this fundamental first step—a simple plan. I hope to have an opportunity later in this hearing to go into the subject in some detail, both with the Air Force witnesses and with those testifying from the General Accounting Office.

The subject at issue is whether we should at this time appropriate funds to construct the Consolidated Space Operations Centers, CSOC. One can hardly question the merits of such a concept; its name implies order and efficiency; however, we are here to look beyond the name.

There is a goal to be achieved by the military in space. The basic goal is keeping the peace in both conventional and unique ways. This can be done through the use of space assets.

There is certainly a need for consolidation of military space activities. Although I commend the Air Force for their recent move in this direction with the announcement of the space command, I am concerned that it is not yet truly a comand. That may come out in discussion later. Consolidation is a national priority that can be addressed effectively by focusing carefully on this question: Can we afford to proceed for the sake of convenience with the product presented to us of a "consolidated space operations center" in the absence of any clear, coherent plan within the Department of Defense for its operation and use?

I don't think that Defense will find a stronger group of advocates for the space program than those of us in this room and certainly myself. I see that Congressman Kramer is with us today. The distinguished chairman, himself, is a strong advocate, as are most Members, if not all Members, of the subcommittee.

We need a strong defense-related space program. No one can advocate the perpetuation of the status quo when we are on the brink of a new challenge, a challenge particularly calling for critical planning. A plan does not evolve by itself; it is actively directed, progressively developed.

We are not confronting an ordinary challenge in this case. We are on new ground, potentially the high ground of space, as it has been referred to. We must approach it with new ideas in a new framework, and that framework needs to be outlined in an overall plan. No such plan appears to exist for the "consolidated space operations center," at least not one that in my experience is adequate for proceeding with construction at this point.

I hope that this impression that I now have can be removed by today's witnesses, Mr. Chairman.

Thank you very much.

Senator LAXALT. Thank you Senator.

Congressman, welcome to the committee. We appreciate the comments you have. The committee has already had your statement made available to it. If you would like to use the statement or summarize it, whatever is your pleasure, it is yours.

STATEMENT OF HON. KEN KRAMER, U.S. REPRESENTATIVE FROM COLORADO

DOD APPROACH TO SPACE

Mr. KRAMER. I thank you very much, Mr. Chairman. I appreciate the opportunity to appear in front of you.

And, Senator Schmitt, I appreciate your interest in this very important area.

If I might, I would like to include my written statement for the record.

Senator LAXALT. Without objection, it will be so ordered.

Mr. KRAMER. Perhaps I will just make some off-the-cuff remarks, if I might.

Senator LAXALT. Certainly.

Mr. KRAMER. I at one point shared Senator Schmitt's concern about fragmentation within the old Department of Defense and the governmental structure with respect to our space efforts. We are still lacking a U.S. space plan. Hopefully, one will be forthcoming this August. We are still lacking a total DOD approach to space. So, I don't think that we can perhaps be too harsh with the Air Force for their own situation internally with respect to the fragmentation.

Because of this concern, we introduced legislation last December that, in effect, called for a reorganization and a new emphasis on space. We identified at that time a number of organizational activities within the Air Force—I believe 13 in number—that had some space aspect to them, and we identified another 12 or 13 such activities outside of the Air Force.

But it was true, as the GAO report, I think, concluded several weeks after the introduction of our legislation, that there was not, in effect, a single manager or focus for space activities.

SUNNYVALE, CALIF., FACILITY

In my judgment, this in no way really obviated the need for CSOC, but it was a problem that needed o be addressed. The reason it did not obviate the need for CSOC is quite simple: The Satellite Control Facility in Sunnyvale, Calif., is not sufficient to meet projected U.S. space satellite control efforts. Not only was the facility reaching its overall capability limits in terms of sheer volume, but it was also especially sensitive to sabotage.

I toured that facility recently. There is no question in my mind that a couple of handgrenades thrown from the interstate could do great damage there. In terms of being a secure facility, it clearly is not the type we need for the kind of sensitive activities carried on there.

Second, the facility is in a high-risk fault zone for earthquakes, so a natural phenomenon as well as manmade danger exists there, and there is no backup for that facility, which means if somehow that facility were lost, we will not be able to control our satellites.

HOUSTON, TEX., FACILITY

With respect to the consolidated portion of CSOC, the same pressures really exist at Johnson Space Center in Houston. I toured that facility also on this recent trip and found out, No. 1, that their control mode there, which has been designed and, in fact, is being constructed right now as we sit in this room, to, in effect, control the first Department of Defense Space Shuttles, has a very limited operational capability. In fact, the limit of the capability of that activity will be exceeded sometime, I believe, in the 1987–88 timeframe. In other words, the number of DOD shuttle flights that are already planned will, in effect, overload that facility.

Again, DOD missions, many of them, will be extremely sensitive and will be of the highest secrecy, yet the classification of that facility is only to secret because it is a publicly accessed facility; so, really, there is no way to control top secret and extremely sensitive missions that may be run on the Space Shuttle.

So, regardless of the fragmentation, there is an absolute need for CSOC, even without a single manager or a bigger focus, because the capability that we have today in place simply will not meet the need. In fact, deferral of this project may not—I wouldn't say may not—will not accomplish anything but put us behind the eight ball with respect to both Shuttle flights of DOD and satellite control.

Since we introduced the legislation—and, I might add, we had a lot of support within the Air Force as to what we were doing—and, as in any new move, there was internal debate, and this was not an original idea to have a space command; it has been in active debate in the Air Force for a number of years—the Air Force has moved ahead vigorously, much to my delight, in consolidating and resolving a lot of the problems, if not all of the problems, posed by the GAO report which said we lacked a focus and lacked a single manager.

AIR FORCE SPACE COMMAND

They have done this with the creation of a space command.

I think that now, as we sit in this room, the argument that there is no focus or single manager or basis from which to evolve our space activities is no longer a viable argument. We have, in fact, joined aspects of systems command and have strategic air command and the Air Force communications command the SPADOC and NORAD in one entity that will give an overall direction to the Air Force space program.

It is also clear to me that this is an evolving situation and will clearly evolve in a way that I think, with DOD cooperation, and again this is not solely an Air Force decision at this point, but DOD, with administration support, we will hopefully have a Unified Space Command within 18 months. What that means is that there will be Army and Navy as well as Air Force participation.

I see this as the basis and the foundation and the cornerstone for the exploitation of space for military purposes that, in fact, as Senator Schmitt indicated, will have the capability of ultimately keeping the peace.

ADVANTAGES TO U.S. SPACE EFFORT

Let me share with you, if I might, in conclusion, my own vision, and I guess I am speaking clearly for myself here and not for the Air Force or anyone else, but I see, quite frankly, ultimately the mission of our space effort being not only to give us the eyes and the ears and the warning capability and the communications capability that it does now, but I see it also as potentially giving us the capability to free ourselves from the threat of nuclear war, at least as an important part in that equation, because space-based systems, I believe, offer potentially to mankind, not today but hopefully within a decade or maybe not too far removed from a decade, the opportunity to change our strategic doctrine from where we rely solely on offensive capability to one where we have both an offensive and a defensive mix, where we will have an enforcement mechanism for a strategic arms agreement in a way we simply do not have now, that we will be able to have a capability against—hopefully that day will never come but if it ever does—to have a capability against incoming bombers and missiles.

By having that capability, we will do more, I think, to deter an attack against us and to keep the peace than any other possibility that exists on the horizon now. That is not today; that is clearly in the future, but I see this command as having that potentiality.

I would hope that the Congress now will do nothing to deter us from having a redundant and a protectable communications and early warning and reconnaissance capability in space and also will give encouragement to moving ahead now to exploit space to the full potential it has for us and the good it can do to our country and ultimately to humanity.

I hope the committee will consider these things in its deliberations and not undo something on which we are finally on the right track and which is desperately needed, not only in terms of the long-term vision but also in terms of the short-term vision of the need of satellite control and Shuttle control.

These are the thoughts that I wanted to share with the chairman and Senator Schmitt and I think probably in a much more intelligent way I have explored these in my statement and have given much more technical detail and discussion of the GAO report and so forth.

Clearly, the new Space Command has been named to operate CSOC. We now have CSOC and a very strong fundamental organizational structure to allow it to reach its full potential.

Thank you very much.

Senator LAXALT. Thank you, Congressman. Your testimony is very helpful to the subcommittee. We know of your interest; that you are an expert in your field is obvious from what you are saying.

What you are saying to us is that the problems we have before the committee and the problems raised by the GAO report have been substantially met and there is no question about the fact that we have to move forward with CSOC for the reasons you mentioned.

I gather you are urging this committee to move forward in terms of the $67.7 million that we have allocated for 1983; is that essentially your recommendation?

Mr. KRAMER. Yes, sir.

Senator LAXALT. Senator Schmitt, do you have any questions, or Senator Mattingly?

Senator SCHMITT. No.

Senator LAXALT. Congressman, you are privileged to stay for the purpose of hearing the other testimony and in addition to that we will adopt you for the purpose of asking questions. if you wish.

Mr. KRAMER. I will stay for a few minutes. If I have to leave in a few minutes, I hope that no disrespect will be inferred from that.

Senator LAXALT. Not in the least. If you would like, we will make a copy of the record available to you.

Mr. KRAMER. Thank you very much. Thank you for the opportunity to testify in front of you.

Senator SCHMITT. Mr. Chairman, I have no fundamental disagreement, except on timing, whether the Air Force is really ready to build the facility.

PREPARED STATEMENT

The prepared statement of Representative Kramer will be placed in the record at this point.

[The statement follows:]

PREPARED STATEMENT OF HON. KEN KRAMER

Mr. Chairman, I appreciate the opportunity to testify before this committee about the Consolidated Space Operations Center, a major Air Force space installation which is presently planned for Colorado Springs.

I would like to detail briefly for you the technical and operational rationale for the CSOC; its interaction with broader organizational issues within the American military space program, particularly as highlighted in a recent General Accounting Office report on the CSOC; and finally, the role of this facility within the new Air Force Space Command that was announced this past Monday, June 21.

TECHNICAL AND OPERATIONAL RATIONALE

This facility is critical to future U.S. military space operations. It is up for its first major increment of military construction funding this year. The fiscal year 1983 request for the CSOC is for $67.7 million to cover the first of 2 years of construction activity, with the balance of the total $145 million military construction cost coming in the fiscal year 1984 request.

The rationale for the CSOC is straightforward: the Air Force and the Defense Department badly need a few facility to house satellite control and Shuttle control operations. At present, Air Force satellite tracking and on-orbit control of satellite is man-

aged through the Satellite Control Facility (SCF) in Sunnyvale, Calif. The on-orbit control of military Shuttle flights for the next 5 years will be performed through an interim facility, called the controlled mode, at NASA's Johnson Space Center (JSC) in Houston, Tex.

However, there are serious problems with both of these facilities. The SCF is located in a heavily industrialized area offering poor security from sabotage or terrorist actions. It is also located near major earthquake faults, raising the prospect that a sufficiently strong earthquake could sever our control of our highest priority satellites. There also is not enough room for expansion because of continuing commercial and industrial encroachment around the Sunnyvale facility.

We badly need redundancy for what is today a single node ground operation at Sunnyvale. We also need to locate that new redundancy in a facility that has plenty of room for expansion and which can also incorporate the new equipment and software that is being phased into such operations. However, we must also assure that this new capability is located in a different location than the geologically vulnerable siting of the Satellite Control Facility today.

The Johnson Space Center in Houston also offers serious problems in its controlled mode of operation for military Shuttle flights. As a NASA facility, JSC's operating philosophy is one of easy accessibility to the public and to commercial operators of space systems. Its operating mode, therefore, tends to have inherently less security than is needed for DOD missions. Consequently, the Defense Department feels that over the long term it cannot fly these security-demanding missions with the safeguards that it needs against security compromises, particularly as the number of missions begins to build up.

Consequently, the CSOC represents for the Air Force and the Defense Department a fully military-controlled mode of control. Current planning calls for the satellite-control portion of the CSOC to come on-line in 1986 and the Shuttle-control part in 1987. With the completion of the Shuttle-control part, control over DOD Shuttle flights will shift to Colorado Springs from Houston, with Johnson Space Center maintained essentially as a backup center. There may also be a potential for using CSOC to provide redundancy for NASA's own Shuttle operations out of JSC.

Without a full-capability CSOC at Colorado Springs—one which could handle the Shuttle-control as well as the satellite-control missions—the Defense Department could continue to use Johnson Space Cneter only at the cost of additional money, continued risks of security compromises, and overloaded mission-control capabilities. Redundancy is badly needed in this area, particularly given the complexity of manned orbital operations with the Shuttle, as well as the heavy reliance we will place on such military operations.

As a result of these converging requirements for redundancy and better security, the Air Force designed the CSOC as a consolidation of two complexes, one controlling satellites, the other military Shuttle flights. Such consolidation offers increased efficiencies through shared overhead and technical support. Another very critical feature, however, is that it encourages close interaction between these two complexes, which at present are located hundreds of miles from each other.

The siting of CSOC at Colorado Springs was also intended to provide other operational efficiencies. First of all, Colorado Springs already is the site of the Cheyenne Mountain complex of NORAD (North American Aerospace Defense Command). The colocation of CSOC and NORAD is especially significant when one looks at the Space Defense Operations Center (SPADOC) complex that is alreay operating inside Cheyenne Mountain. The new Space Command's siting in this area also adds to operational efficiency.

The SPADOC is designed to track, and defend against, hostile enemy actions aimed at our satellites. These satellites could include civilian as well as military satellites. The CSOC, on the other hand, is designed to manage the military satellites that SPADOC seeks to protect. Given the pace of Soviet space warfare activities, SPADOC may acquire an even more difficult, complex task than it has faced so far.

The close siting of CSOC and SPADOC thus makes operational sense, particularly when one realizes that the Air Force's "pool" of officers qualifed for such extremely complex space operations is a limited one and must be carefully managed. With the siting of both facilities in Colorado Springs, this scarce Air Force expertise can be used more efficiently. The new Space Command will very likely enlarge this pool.

I should note that these kinds of space operations represent activities of high complexity and will require sustained computational and communications support on the ground. It thus makes sense for the Air Force to site these facilities, which share a lot of commonality, in the Colorado Springs area.

INTERACTION WITH SPACE ORGANIZATION ISSUES

However, the CSOC also figures in another way. On January 29, 1982, the General Accounting Office relased a report entitled "Consolidated Space Operations Center Lacks Adequate DOD Planning" (MASAD-82-14). This analysis was highly critical of Air Force and Defense Department planning and organization for space operations. The GAO perceived CSOC as requiring major changes in Air Force and Defense Department approaches to space operation before its capabilities could be fully used. Consequently, the GAO recommended that Congress restric the funding of the CSOC to the level required for an "interim" satellite operations complex, or SOC, until the Defense Department had completed an adequate plan for the military exploitation of space and the cost/benefit analyses related to that. It also urged the Secretary of Defense to designate a "single manager" to manage military space development and operation.

I should note that the GAO's observations about fragmented and diffuse organization of Air Force and DOD space operations paralleled my own at that time. I have long been concerned about these deficiencies and sought to redress them by introducing on December 8 a bill, H.R. 5130, that called on the Secretary of the Air Force to assess the desirability and feasibility of a space command that would consolidate and streamline a good deal of this fragmented organization. My bill suggested that such a study of a new space command would cover the possible use of existing command structures inside the Air Force as the building blocks for such a new entity.

THE NEW AIR FORCE SPACE COMMAND: THE ROLE OF CSOC

I am happy to report that the Air Force has very recently taken a major and dramatic initiative to address the organizational and managerial problems that the GAO discussed in its January 29 report on the CSOC. On Monday, June 21, the Air Force announced the creation of a major command for space, one which will provide an operational focus for activities that today are carried out through a number of separate organizations. But a more important aspect of this new command is that it will focus on the evolving space mission of the Air Force. There is little doubt that it will quickly become one of the most important commands in the Air Force, given the increasing importance of space operations to our national security.

According to the Air Force, this new Space Command will perform a number of functions. It will provide focused, centralized planning as well as advocacy for space systems, including those that will service globally deployed American forces. It will also enhance the vital support that such systems already provide to operational users, while also better integrating space systems into our present force structure. Finally, it will also reduce expensive duplication by consolidating requirements and making better use of our scarce resources.

As I see it, this Air Force initiative answers, in a fundamental way, the problems that the GAO identified in Air Force space organization in its January 29 report. But of equally great significance is the possibility that this new command will evolve into a "unified", or multiservice, command within a short time. Such a unified command might resolve another area of concern to the GAO; the organizational and planning deficiencies in DOD space organization and the organizational linkages with the space activities of other services, such as the Navy. Thus, there is little doubt that the new Space Command, particularly if it evolves into a unified command, will help to redress the GAO's concern about the need for a "single manager" or our Nation's military activities in space and provide for a better, more integrated approach to such operations.

The GAO report also expressed concern about an overall military space plan. In this regard, I should note that there is presently underway a national space policy review that includes an extensively researched military space policy study. This review is scheduled for completion by August.

It is, therefore, in the context of these new developments, which redress many of the concerns that a number of people in Congress, including myself, have shared, that the CSOC should be considered. For what quickly becomes apparent is that the creation of a major command for space highlights vividly the need for a full-capability CSOC as soon as possible.

The Air Force has decided to make the new Space Command the operator of the CSOC. Although this facility is being developed by Air Force Systems Command, the new Space Command—which will formally come into existence on September 1—will work closely with AFSC to provide operational planning. In addition, a close operational linkage will exist between the Space Defense Operations Centers, which will be managed by the Space Command, and the CSOC for the mission of satellite attack warning, just as the SPADOC provides the same service today to the Satellite Control Facility in California. Thus, the Space Command will operationally link up our most critical control facilities: the SPADOC, the CSOC, and the Satellite Control Facility.

The CSOC will also control military Shuttle flights, while the SPADOC will provide surveillance and warning of any hostile moves against such flights. The Space Command will be positioned to link up all aspects of our future military operations in space.

I would like to say a few words about satellite attack warning. On the same day the Air Force announced the Space Command, the press reported the details of an omnibus, unprecedented Soviet strategic exercise that simulated a comprehensive nuclear attack on the United States. This attack was initiated with antisatellite operations against our early warning and reconnaissance satellites, a move which could blind and confuse our leaders. It was followed by a "ripple firing" of ICBM's and SLBM's and concluded with antiballistic missiles firings, which presumably would seek to catch those American warheads that survived the initial Soviet attack.

This Soviet exercise pointed out that the Soviets themselves recognize our "space dependence," particularly in early warning and reconnaissance, and fully intend to exploit it. However, I wish to point out that an equivalent "decapitation," and an equally dangerous one, could be caused by earthquake or terrorist damage to a single vulnerable satellite control complex in California. It is in this context of our "space dependence" that we urgently need a full-capability CSOC.

I would like to conclude with several observations about the cost of the CSOC. The GAO report estimated the full cost of the CSOC at $1.4 billion through 1990. However, it arrived at these costs by aggregating not only the research, development, engineering, and construction of this project, but also its manpower and its operations and maintenance costs. Given the manpower-intensiveness of a facility such as CSOC, there is no question but that it will end up looking expensive.

But we should remember that the military satellites that the United States puts up have to have a "ground segment" somewhere on the ground to control them, whether that segment exists in Colorado or somewhere else. The complexity of military satellites is such that they often have a considerable cadre of people on the ground looking after them, whether these people are located in Sunnyvale or in Colorado Springs, or perhaps other locations. It is part of the rationale for CSOC that it will provide for an efficient addition of new mission control complexes as such new programs as the global positioning system phase into operation.

We should also balance the "cost" argument with the "benefit" argument, in the case of program like GPS. For satellite programs like these will be heavily used by the civilian sector: oil companies, fishermen, shipping firms, and many others. Thus the CSOC, which will operate the GPS, will not only be managing military satellites for military users, but will perform a unique national service for other users as well.

It is for these reasons that I urge this committee's support of the fiscal year 1983 request for military construction funding of the CSOC. The fiscal year 1983 request would include a complete technical facility and powerplant for the satellite control and Shuttle control complexes, with the fiscal year 1984 request allocated to the necessary engineering and support facilities. I cannot stress too much the importance of getting this facility underway.

I appreciate the oportunity to testify before the committee and would be glad to answer any inquiries about this critical national facility.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

ENGINEERING AND SERVICES

STATEMENT OF MAJ. GEN. CLIFTON D. WRIGHT, USAF, DEPUTY DIRECTOR FOR ENGINEERING AND SERVICES, DEPARTMENT OF THE AIR FORCE

ACCOMPANIED BY:

HON. EDWARD C. ALDRIDGE, UNDER SECRETARY OF THE AIR FORCE

BRIG. GEN. B. P. RANDOLPH, USAF, DIRECTORATE OF SPACE SYSTEMS AND COMMAND CONTROL COMMUNICATIONS, DEPARTMENT OF THE AIR FORCE

PROGRAM SUMMARY

General WRIGHT. Thank you, Mr. Chairman.

I am pleased to appear before your committee to discuss four programs of national interest in our fiscal year 1983 military construction request. These programs are the MX; the space transportation system—Space Shuttle; the Aeropropulsion System Test Facility, ASTF; and the Consolidated Space Operations Center, CSOC.

We are requesting $425 million in MILCON this year to continue these programs. This represents about 20 percent of our total fiscal year 1983 request of $2.1 billion.

With your concurrence, I will give you a brief summary of these four programs:

MX BASING MODE

First, our request this year in support of the MX is $207 million. Since our budget submission we have further refined our request such that we can now identify $103 million in known requirements and $104 million for evolving requirements in suport of a permanent basing mode.

Senator LAXALT. What does "evolving requirements" mean?

General WRIGHT. This is the new basing mode system.

Senator LAXALT. You are talking basically about dense pack?

General WRIGHT. Yes, sir.

Senator LAXALT. What does that evolve in relation to dense pack?

General WRIGHT. Rather than get into the details right now, I would suggest that we might want to defer that until later. We may want to go into executive session.

Senator LAXALT. I think you are probably correct.

General WRIGHT. Known requirements include $16.7 million for various logistics and repair facilities at Hill Air Force Base, Utah, and Newark Air Force Station, Ohio, which are common to any basing mode; $20 million for several new flight-test silos at Vandenberg Air Force Base, Calif.; and $66.3 million for weapons systems support facilities at the deployment base.

SPACE SHUTTLE

Second, we will look at the continuing construction program to support the Space Shuttle.

The STS construction effort at Vandenberg is moving well. We started that effort in 1979 when the launch complex was approved. Since then Congress has approved additional projects through fiscal year 1982 which consist of orbiter processing facilities, rocket booster and external tank facilities, landing facilities, and various support activities.

Our current construction effort at Vandenberg is valued in excess of $300 million and is about 66 percent complete. We have to contracts scheduled to be awarded by July, which will place our entire program through fiscal year 1982 under construction, except for the Port Hueneme Facility, which will be addressed in a short briefing for you.

This year we are requesting $82.2 million for the STS at Vandenberg and other locations. A recently approved reprograming action will modify our request and will be addressed by Major Link in his briefing. Our current estimate to complete all required STS construction requirements at all locations is $628 million through fiscal year 1986.

AEROPROPULSION SYSTEMS TEST FACILITY (ASTS)

Third, I will briefly discuss with the committee the ASTF project currently under construction at Arnold Air Force Station, Tenn.

Last year I reported to the Congress that the Aeropropulsion Systems Test Facility at Arnold AFS, Tenn., would cost $138.4 million more than we had anticipated. The committees responded to our requests for reprograming and during this past year we have committed approximately $80 million of our total estimate to the construction effort. With those funds we have been able to allow the Corps of Engineers to begin negotiations with the contractor on changes and time extensions.

We have also initiated procurement of the automatic test control system and test instrumentation system and have been able to extend our contracts which provide the technical support necessary to see us through to the activation and integration phase of the project.

We are not completely out of the woods yet, but it has been over 1 year since we put together our estimate and schedule to completion and we still feel confident in them.

We will reach some major milestones in June which, if successful, will give us even greater confidence in our position, and I feel we are on track with that important program. The $42 million that we are requesting this year is our final request for funds to complete this project and we will address it further in a short briefing later in the hearing.

Senator MATTINGLY. Is that $42 million on top of the $80 million.

General WRIGHT. Yes, sir. The $80 million is what we have obligated out of the amount appropriated in 1982, so it would be a difference between $42 and $138 million; $96.4 million was the total amount appropriated.

You will remember, we had a reprograming earlier last year for $14 million on it.

CONSOLIDATED SPACE OPERATIONS CENTER (CSOC)

Finally, Mr. Chairman, we will look, as you said earlier, at the Consolidated Space Operations Center or CSOC. This center is designed to control on-orbit DOD satellites and conduct future DOD Space Shuttle missions.

Construction funding is broken into two phases: Phase I includes the Utility Plant and Technical Building, both of which require a longer construction period than phase II, which completes the infrastructure, and phase III will add an Engineering and Support Facility. We need to get the Technical Building done first so there will be time to install and integrate communications, computers, and technical systems.

Site specific design and progress on land acquisition has been held in abeyance, in conformance with conference report 97–400 for the fiscal year 1982 MILCON appropriations dated December 11, 1982, pending review of the GAO report.

The conference report specified a 60-day waiting period for the House and the Senate Appropriations Committees to review the GAO report after publication on January 29, 1982.

Design of the CSOC is 60 percent complete and is currently under review. The Air Force expects to complete its review tomorrow and hopes to be able to direct the architect/engineer to proceed to design completion at that time.

The Air Force is also ready to direct the Corps of Engineers to proceed with the acquisition of a perpetual right-of-way from the State on which the CSOC will be sited, near Colorado Springs, Colo.

Today we seek your concurrence to proceed with the design and land acquisition for the CSOC.

I have asked Major Byrne, from the Directorate of Space Systems, Command and Control and Communications to present a brief overview of the program and its objectives, and that is available to the committee whenever you would like, in more detail.

Mr. Chairman, that completes my overview of the Air Force national programs totaling over $425 million. There can be no question that construction investments of this magnitude should continue to receive close management attention by the Air Force and careful periodic examination by the Congress.

We are now prepared to begin the briefings and because of the classified nature of several programs we suggest the committee go into closed session, to be followed later on with short presentations on the other three programs.

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Senator LAXALT. Thank you very much, General.

MX BASING

As you know, focusing on the MX for just a moment, the authorization, as I understand it from Armed Services, presently is $207 million. Where are we in connection with that disparity now?

General WRIGHT. Between the $103 million that we have identified?

Senator LAXALT. Yes.

General WRIGHT. Primarily, sir, the funds, the difference between $207 and $103 or $104 million, those dollars will be required for technical engineering studies and designs related to the new basing mode. We are just beginning to look at those right now.

I can't clearly define for you exactly what those funds will be required for.

Senator LAXALT. What are we looking at, timewise, in terms of expenditure, since the final determination on the basing mode has not been made and, I gather, will not be made until sometime around the first of December? That is the present timeframe; is that correct?

General WRIGHT. That is right. Right now we will only be able to put together the plan for developing the architecture-engineering and technical studies required.

I would think by mid-summer or August we should have a very clear picture of the magnitude of the work that we are going to have to do in terms of the numbers and types of studies, but I don't know that right now.

Senator LAXALT. Is any of this money going to be allocated to the possibility of going to Minuteman or is Minuteman gone?

General WRIGHT. To preserve the silo basing mode, it is possible that some of that money could be used to continue some of the studies.

Senator LAXALT. Air control, looking into the air support system?

General WRIGHT. No, sir; it is all related to the ground basing.

Senator LAXALT. Whatever money we are talking about here is all ground basing?

General WRIGHT. Yes, sir.

Senator LAXALT. I gather most of its now is geared to dense pack?

General WRIGHT. I think it will be, yes, sir.

Mr. ALDRIDGE. If that is the decision by the President, to proceed in that direction in December, that is where the money will be allocated.

General WRIGHT. We are talking about the dollars in addition to the $103 million that I defined for Hill Air Force Base, Newark Air Force Station, Vandenberg and the support base. We have clearly defined our requirements for the $103 million in that category.

Senator LAXALT. In a sense, you are talking about the other $104 million?

General WRIGHT. Yes.

Senator LAXALT. Senator Schmitt, do you have any questions on this?

Senator SCHMITT. No; I think I will wait until the general presentation.

Senator LAXALT. Let us proceed to hear from Secretary Aldridge. Thank you very much, General.

CONSOLIDATED SPACE OPERATIONS CENTER

Mr. ALDRIDGE. Thank you, Mr. Chairman.

I have a formal statement which I would like to insert in the record. If you have no objection, I would like to summarize that statement and amplify on a few points in the statement that I know are of great interest to this committee.

Senator LAXALT. That will be more than acceptable, Mr. Secretary.

Mr. ALDRIDGE. Afterward, we do have some detailed presentations according to your desires. We can go into the CSOC or MX or Aerospace Test Facility.

Senator LAXALT. Will that require an executive session?

Mr. ALDRIDGE. No, sir, I don't believe so. If you wanted to get into details on MX, it would require an executive session.

Senator LAXALT. I don't believe it is necessary. We have been fully into it already.

Mr. ALDRIDGE. As I mentioned, I would like to briefly review the rationale for the Consolidated Space Operations Center, CSOC, and to show that many of the criticisms that have been stated about the CSOC are really, I believe, based on misunderstanding or misconception.

As Congressman Kramer has already pointed out, the first function of the CSOC is really to share the satellite control functions of the Satellite Test Center at Sunnyvale and thus provide a redundancy to our very critical satellite control facility network. The second function is to control the DOD launches of the Shuttle which require unique operations under proper security and protection.

SUNNYVALE, CALIF., FACILITY

The Satellite Test Center, or STC as we call it, supports several critical DOD satellites essential to the support of our national security. It is located, as Congressman Kramer pointed out, adjacent to a major freeway and congested area in Sunnyvale, Calif.

Senator LAXALT. You share his concerns on security?

Mr. ALDRIDGE. Yes, sir. That is one of our primary concerns. In fact, I can't emphasize enough the catastrophic conditions if we lose that facility, either through a national disaster or through some other deliberate destructive action. We would lose a very vital DOD shuttle and space facility.

Senator SCHMITT. I totally concur in that. We have waited far too many years to build up that backup facility. The whole thing started when we tried to get a site for that facility. The planning, such as it was, expanded to include other things and that has delayed the project.

Mr. ALDRIDGE. By distributing the operations between the Satellite Test Center and the CSOC, we will be taking, I believe, an important step in removing this catastrophic event and building really a more robust and more effective satellite control network.

SHUTTLE PAYLOAD

As you well know, the first payload of the Shuttle will be launched this Sunday, June 27, at 11 o'clock. The Johnson Spaceflight Center has been modified to be able to handle this classified payload and subsequent classified DOD payloads.

In spite of the modification, specific problems remain. First, the modification will not accommodate the planned rate of DOD launches after 1985. It is not designed to do that. Second, the security provisions that have been provided at Johnson are still marginal, especially for very sensitive national security payloads.

The Johnson Spaceflight Center modifications cannot accept mixed classified and unclassified payloads on a single launch. It is not designed to do that. I believe if we are to really fully utilize the Shuttle potential, we are going to have to have a CSOC which does have those proper security provisions after 1985. We need the CSOC right now, sir, but we have accepted a compromise date of 1986 for the Satellite Test Center backup and will have the Shuttle operations capability in 1987 when the Johnson Spaceflight Center will not be able to handle the rate of classified launches.

Senator LAXALT. Technical, 1985?

Mr. ALDRIDGE. 1986 will be the backup for the Satellite Test Center. In 1987 we will have the Shuttle operations capability at the CSOC. That is consistent with the time when we expect the rate of DOD launches to exceed the capacity of the Johnson Spaceflight Center, even though we still believe the security provisions are still marginal at Johnson even up to that time.

Senator LAXALT. What you are saying essentially is that for us to adhere to this timeframe you are going to need this 1983 money on time?

Mr. ALDRIDGE. Yes, sir.

There have been many criticisms of the CSOC which we do not believe are supported by the facts. We believe these criticisms are based on misunderstanding or perhaps misconception. In January 1982, the GAO report asserted that CSOC lacked adequate DOD planning. An indication of that is that if we had better plans, the operational concept for the CSOC would change.

We believe two things could happen: First, it could get smaller by splitting the two functions. We have already explored that option and are convinced that consolidation of these two functions is the proper choice; they are very similar in nature.

Second, we consolidate more functions that would make the CSOC larger and more complex and require costly moves of existing space-related functions such as the Space Defense Operations Center which is currently located inside the Cheyenne Mountain complex.

We believe we made the proper choice for the CSOC. We recognize that while the basic CSOC functions will remain, the scope of these functions may change in the future. We have, therefore, designed flexibility and growth potential into the CSOC to accommodate a modest amount of expanded satellite missions and satellite operations.

The GAO report states there is not a single manager within the Department of Defense for the management and operation of space. While that statement implies a lack of management—and I will address that in just a minute—it really has nothing to do with the CSOC. The CSOC performs those essential functions which are independent of how we manage our space operations.

MILITARY EXPLOITATION OF SPACE

The GAO report also claims there is no overall plan for military exploitation of space. I believe this is also a misleading assertion. I think most of us understand that in the inherent dynamic nature of the planning process plans are continuing to evolve and are under constant review and change to keep up with the technology and also conditions of the world and circumstances.

In spite of this assertion, we believe that there are fundamental, direct domestic activities underway to set the proper course for our future direction in space. We have set forth policies which seek the expansion of our capability for military missions in space, to assure sharing of capability for access to space and a vigorous R&D program to give us future operations.

We are pursuing programs to make our military space systems more robust and more survivable, to exploit evolving technology and enhance our spacecraft capability and to improve the support provided from space systems to our military commanders.

We clearly recognize the extraordinary value of timely information obtained from space systems to support our military operations. We anticipate that the Secretary of Defense will approve a DOD space policy consistent with the main thrust of these principles that I have just outlined. The plans for specific space capability in the long term are obviously more uncertain and will likely remain so.

There are issues on weapons in space, Shuttle management, future launch systems and new space missions, but these issues are currently receiving intensive study by both DOD and the National Security Council interagency groups.

I guess the point I am trying to get to here is that while there are many uncertainties as to where we are going in the future, we have studies underway to give us those directions and we believe they are heading in the right direction.

DOD/NSC COORDINATION

Senator LAXALT. Is the coordination between DOD and NSC going well?

Mr. ALDRIDGE. Yes, sir, very well. The activities have been coordinated quite closely. We find that, really, there are very few issues that remain between all the agencies which have a space-related responsibility.

With regard to the organization, the Air Force has had active review of the management of the space operations, and just this week, on Monday, the Air Force announced creation of an Air Force Space Command, with an implementation date of September 1 this year.

Senator LAXALT. Does this have the blessing of DOD overall?

Mr. ALDRIDGE. Yes, sir.

Senator LAXALT. The Joint Chiefs?

Mr. ALDRIDGE. As far as I know, sir. This is an internal Air Force decision to reorganize, to consolidate, the space activities. I did brief Secretary Weinberger and Secretary Carlucci and the Secretary of the Navy. I have talked informally to the Secretary of the Army about it, and the CNO and, of course, General Allen, who is a member of the Joint Chiefs, who made the announcement. I find no one who objects.

Senator LAXALT. You think it is all right?

Mr. ALDRIDGE. Yes, sir, it is.

Senator SCHMITT. The only problem may be that they didn't consolidate enough.

Mr. ALDRIDGE. We have to recognize the fact that this has to be an evolutionary process. You can't create something like this in one jump, major jump, without making sure we are making the right decision. So, we have deliberately started an evolutionary process.

The next step has to be beyond the Air Force; it has to go to the Department of Defense. If we are to create someday in the future a unified command, it will take approval of the Secretary of Defense, the President, and the Congress.

Senator SCHMITT. I am talking about within the Air Force itself, the major components are not consolidated under the Space Command. I am not talking about the DOD as a whole; that is another question.

Mr. ALDRIDGE. There are specific issues that still remain in the implementation of the Space Command which have not been worked out. There are still some uncertainties as to what systems will be incorporated and what systems will not be incorporated. We have instituted a command activation task force to work those details out.

As far as I am concerned, as far as the Air Force is concerned, the majority of the Air Force space systems will fall under that command structure.

We believe this step is directed toward a more integrated and efficient acquisition, launch, and operation of DOD space systems. The CSOC in performance of its two functions is an essential part of it and plays a vital role in the space management.

The GAO report suggests the Shuttle control portion of the CSOC will be delayed because there is only one Shuttle. This illustrates, in my view, a lack of understanding or misinterpretation of our program and plan.

NASA has four orbiters in various states of operation and we hope there will be some more. Even with four orbiters anticipated, DOD mission traffic will exceed the secure mode capacity of Johnson in 1987. If anyone believes that our entire space program was based upon one orbiter, it would have significant and broad consequences for national space activity well beyond just the CSOC.

Expected procurement of launch vehicles, Vandenberg Air Force Base construction and a multitude of payload designs—it is not clear to us what the GAO report is talking about on this point. We have commented to that effect.

OBSOLETE COMPUTER HARDWARE AND SOFTWARE

The GAO expressed concern about obsolete computer hardware and software. The fact is that the computer family selected for the satellite control architecture was the result of 18 months of competitive design effort with three contractors participating.

The computer proposed by the winner under a fixed-price option meets our requirements.

With regard to software, our desire to transfer large amounts of already developed Shuttle control software is consistent with good economic principles and our evolutionary development approach to the CSOC. We have already demonstrated the feasibility of running Shuttle software on the new computer family.

In summary, we are convinced that we have taken a prudent and balanced approach to the CSOC design in operational concept. It is not more than we need to meet our current and future requirements, nor is it less. The design is built on existing capability at the Satellite Test Center and the Johnson Spaceflight Center and provides the necessary flexibility to expand this base to meet likely potential future requirements.

Mr. Chairman, on May 18 the facility design work on the CSOC stopped. If we are to avoid delay on getting this critical site operational to avoid increased cost, we must be given a permit now to proceed with CSOC acquisition.

[The statement follows:]

PREPARED STATEMENT OF HON. EDWARD C. ALDRIDGE, JR.

UNDER SECRETARY OF THE AIR FORCE

Mr Chairman and members of the committee, I am pleased to be here this morning to address the construction associated with some of our national programs. Pursuant to the Committee's request, Gen Wright will provide a military construction overview of MX, the Air Force Shuttle program, the Aeropropulsion System Test Facility (ASTF) and the Consolidated Space Operations Center (CSOC).

Before we hear from General Wright, I would like to share with you some of our evolving plans for the applications of space systems to support Air Force missions. In doing so I will focus on construction of the Consolidated Space Operations Center, (CSOC) which will be an impo tant element in our overall space operations network.

Today the Department of Defense operates satellites for early warning, attack assessment, surveillance, navigation, meteorology and communications. We are also committed to the Space Transportation System and the use of the Shuttle as the Nation's primary launch system. Our growing reliance on satellite systems makes it increasingly important that we have effective, reliable means of operating and controlling these spacecraft. Shuttle operations involving Defense payloads will also introduce new dimensions for military planning. Planning must now include the Shuttle's role not only as a heavy lift launch vehicle but also as a manned orbiting platform. The opportunity the Shuttle offers for direct interaction between the orbiter crew and the mission payload has enormous military potential. If we are to take advantage of this potential we must move forward with our space control systems.

CSOC is the necessary next step in space control systems and will combine satellite control operations with Shuttle operations and planning in a new facility. CSOC offers advantages in expanding the capacity of our space control network while at the same time

eliminating reliance on single critical nodes. It also provides us the capability to conduct Shuttle missions carrying sensitive national defense programs at an appropriate security classification level. We will be able to protect classified information with sufficient flexibility to segregate data from DOD and non DOD payloads flying in the same mission. This is an area that presently gives us a great deal of difficulty with the interim control system at NASA's Johnson Space Center. In addition, the close interaction between the satellite operators and the Shuttle operators in CSOC is important not only for effective near term use of the Shuttle but also in devising new applications.

As you are aware, the GAO published a report in January 1982 that asserted that the CSOC lacks adequate DOD planning. The Defense Department officially responded to this report by letters dated Jan 20, 1982 and Apr 22, 1982. The GAO on Mar 22, 1982 issued a supplemental letter report that addressed the DOD response and in effect reiterated the assertions in the original GAO report. By letter of June 21, 1982 the Department of Defense again attempted to clarify the basic issues and correct GAO misconceptions. This Department of Defense letter stated regarding CSOC that "we feel particularly strongly that satisfaction of a critical requirement in support of national security space operations should not be deferred pending implementations of the GAO's perception of how the Department of Defense should be organized."

Let me now briefly discuss what I feel to be the two fundamental issues raised by the GAO. The first issue deals with GAO's desire for the designation of a single DOD manager for space and the assertion that there is lack of overall planning for space exploitation. I do not believe that the DOD disagrees with the ultimate goals descibed by the GAO but rather with the recommended pace especially as it relates to the CSOC. Nobody in the Executive Branch is standing still with respect to space policy or space organizational structure. The administration has undertaken a broad review of national space policy. Within DOD a Defense Space Operations

Committee, chaired by the Secretary of the Air Force, has been established. The Air Force has established a Deputy Commander for Space Operations at the Air Force Systems Command Space Division and in the Headquarters a new Directorate of Space within the Office of the Deputy Chief of Staff, Plans and Operations has been formed. Most importantly, the Air Force just this week announced the creation of a new major command called "Space Command" with an anticipated implementation date of Sept 1, this year.

All of these activities are directed toward a more effective structure for management and operation of DOD space systems. CSOC, however, will perform specific technical functions at the "nuts, bolts and data bits" level of space operations. We cannot defer acquisition of critically needed capability pending implementation of the GAO's perception of how the Department of Defense should be organized. I believe there can be no point organizational solution; we will see a continuing evolution. CSOC is a significant part of that evolution. As presently constituted, the CSOC functions would be equally applicable to any management alternative we can reasonably expect to occur.

The second fundamental issue the GAO raises has to do with our acquisition planning. My understanding of the GAO view is that an overall space plan would expand the CSOC missions and that functional integration of these new missions in a single system design would be a more efficient acquisition approach. My experience in the real world problems of systems acquisition convinces me a more conservative approach is appropriate.

I have no doubt that CSOC will expand in the next decade as new missions develop. Our plan, however, is to evolve the CSOC systems from ongoing Air Force satellite control programs and NASA's Shuttle control systems. This greatly reduces the cost and schedule risks that would be associated with the large new development effort advocated by GAO, particularly if other missions are to be included from the onset. It also preserves the network interoperability features that are part of the basic CSOC motivation.

The ability to accomodate evolving requirements and growth is an important aspect. We believe our design concept provides the inherent capability to meet the needs of future satellite programs as well as new manned missions such as a space station. Evolution is a fact of life in space operations and our modular system design has advantages in terms of configuration control, interoperability and flexibility to meet changing mission requirements.

The GAO expressed concerns about computer systems, citing selection of "obsolete" hardware and software resulting from a hastily conceived implementation plan. In fact, the computer family selected for the new satellite control architecture was the result of an 18 month competitive design effort with three contractors participating. The mainframes proposed by the winner, under fixed price options, provide a spectrum of capabilities that can be matched to the needs of the individual satellite programs. The computers offered were the latest available when the bid was made; we are already investigating, however, the use of later, more capable machines of the same family at reduced cost. The software development is in accordance with the design methodology associated with the DOD standard language, Ada. It should be noted that while Ada compilers are not yet available, the software system structure meets the DOD standards. The transfer of large amounts of Shuttle control software into this environment seems consistent with our evolutionary development approach. We have already demonstrated the feasibility of running the Shuttle software in the new family of computer mainframes.

The GAO also suggests that the Shuttle control portion of CSOC be delayed. Their rationale is that the CSOC requirement to support 12 to 14 military Shuttle flights per year assumes the existence of a substantial fleet that does not exist. In fact, the projected delivery dates for the next three orbiters are Jun 82, Sep 83, and Dec 84. We are building launch facilities and designing satellites based on the existence of the four orbiter fleet and it

does not seem inconsistent to me that we should proceed with the military Shuttle control facilities as well.

The military construction is the pacing item for CSOC implementation. This is because the lead times for system installation and checkout are long. The FY 83 CSOC MILCON request is based on the need for technical facilities in 1985 to begin the installation of satellite control systems. We also expect a long checkout period with NASA to verify that CSOC is ready to operate the Shuttle. Until CSOC is available, we must continue our Shuttle operations at Johnson Space Center with undesirable work-arounds. I believe we need to get on with CSOC construction now. In December, this committee restricted CSOC site specific design pending review of the GAO report. The time specified for that review has expired. We have placed a hold on further site specific design activity, Mr Chairman. If you have no objections, we plan to remove that hold and proceed with completion of the design.

GENERAL ACCOUNTING OFFICE

STATEMENT OF WALTON H. SHELEY, JR., DIRECTOR, MISSION ANALYSIS AND SYSTEMS ACQUISITION DIVISION, U.S. GENERAL ACCOUNTING OFFICE

ACCOMPANIED BY:
NORMAN AUSTEN, GENERAL ACCOUNTING OFFICE
CHARLES REY, GENERAL ACCOUNTING OFFICE

NEED FOR CSOC

Senator LAXALT. I think we will proceed now, if we can, to hear from the GAO. Mr. Sheley?

Mr. SHELEY. I also would like to submit my formal statement for the record.

Senator LAXALT. That will be fine. In view of the rebuttal that Secretary Aldridge has made to the GAO report, you should also meet the specific points he has raised.

Mr. SHELEY. I have made notes.

We don't have a quarrel with them; they ultimately need CSOC. Our concern has to do primarily with the timing and whether they are ready to go forward at this point in time, and the technology they plan to employ.

SUNNYVALE, CALIF., FACILITY

Again, I would echo both Congressman Kramer's and Secretary Aldridge's concern about the Sunnyvale facility. It has been several years since I was there. Unquestionably, it is not a secure facility. One of the things that impressed me the last time I was there was the whole growth of industry right around the outside gate of that facility. That leaves a question in my mind as to whether we have enough land for the CSOC facility in Colorado. They are presently acquiring one section, which is 1 square mile. That sounds like an awful lot of real estate, but if this facility does ultimately get to be a large facility, you are going to have the contractors congregating outside the gates. I am concerned whether or not enough land is being acquired.

I was pleased to hear Secretary Aldridge emphasize that a DOD space policy might be forthcoming. That would relieve a great deal of our concern.

Senator LAXALT. Were you concerned in that respect that it was going to be limited, or has been limited, historically, purely to the Air Force?

Mr. SHELEY. Yes; each service had its own policy in space. I would welcome a DOD policy. I think it is essential if you want to get serious about exploiting space for multiple uses.

Secretary Aldridge referred to the Shuttle and the fact we must be assuming that only one Shuttle will be available. That is not correct. We

used NASA's schedule which was current for a turnaround schedule based on a four-orbiter capability.

I wish to recognize, too, this very week, NASA has cut back on the number of flights that they previously had said they would be able to schedule in the near term because of problems with turnaround.

I will rest my case at this point and will be happy to answer questions later.

[The statement follows:]

PREPARED STATEMENT OF WALTON H. SHELEY, JR.

DIRECTOR, MISSION ANALYSIS AND SYSTEMS ACQUISITION DIVISION

GENERAL ACCOUNTING OFFICE

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to testify concerning our review of Department of Defense planning for a Consolidated Space Operations Center (CSOC). This evaluation was done at the request of the Chairmen, Committee on Appropriations and Subcommitee on Defense, and the Subcommittee on Science, Technology and Space, Committee on Commerce, Science and Transportation. At their request, we issued our report (MASAD 82-14) to the Congress on January 29, 1982.

Our work focused on overall military space planning and its implication for the development of the center. We reviewed the evolution of siting criteria and the unique operational and organizational factors bearing on final site selection, as well as the cost and legal ramifications involved.

Since 1977, the Department of Defense has recognized the need for a backup capability to the Satellite Control Facility at Sunnyvale, California which is located in a zone of high earthquake damage probability. Also, since the early 1970's, the Space Shuttle has been viewed as a replacement for expensive military satellite launch vehicles. The backup for Sunnyvale satellite control operations and a secure military command center for sensitive DOD Space Shuttle operations were considered as candidates for colocation since their inception. In 1979, at the request of the Office of Management and Budget, the Defense Department examined into whether the two systems could be merged into one center, and the concept of the Consolidated Space Operations Center was born.

After three years of evaluating candidate sites for the CSOC, the Air Force selected a section of Colorado State land 10 miles east of Peterson Air Force Base at Colorado Springs, Colorado. The Air Force is requesting $67.7 million for Fiscal Year 1983 Military Construction and $20.7 million for Fiscal

Year 1983 Procurement, to begin construction of the CSOC, which it hopes to have partially operational in 1986. The fully operational center is expected to cost $1.2 billion by 1990.

In our review of Consolidated Space Operations Center plans, we were hampered by the fact that there is no definition of exactly what the center is expected to accomplish. Nor did we find adequate Air Force consideration of various cost-effective alternative approaches. Beyond this, there is no central manager for military space operations to define the role and mission of the center relative to other space programs.

Briefly, the findings of our review were:

-- The need for immediate construction of a backup capability for the Sunnyvale Satellite Control Facility appears justified.

-- The site selected for the CSOC near Colorado Springs is technically acceptable as far as its ultimate mission can be surmised without an overall space exploitation plan.

-- There appear to be no legal barriers to the Air Force utilizing the chosen site at this time. However, the real estate transaction has not been completed.

-- There are about 10 activities in the Federal government, concerned with military space activities, each with its own version of space exploitation programs.

-- The Air Force has not given sufficient attention to the possibility of significant cost savings through the incorporation of many of these individual space programs into a truly consolidated space operations center.

-- The Air Force currently plans to utilize computer technology developed about 1977 for the center. Given the current rate of computer development, those computers will be obsolete before the center is fully operational in 1990.

-- New developments in software technology have not been adequately considered. For example, DOD is standardizing on a new high-level language called Ada. Yet, plans for the center are to use older FORTRAN and JOVIAL languages.

-- The Controlled Mode, a secure operational complex at

Johnson Space Center, appears adequate for the number of Space Shuttle vehicles that will be available for military missions in the near future. We think this relieves the element of time criticality for a Shuttle Operations and Planning Center now planned to be built at Colorado Springs.

-- No overall plan exists for military space exploitation, and the Air Force role has not been adequately defined to provide strong central management of the programs involved.

-- Because of fragmented, and in some instances inadequate planning, we were unable to determine the cost effectiveness of the Air Force approach. As stated, it appears that the Air Force expects short term software development cost avoidance by replication of Johnson and Sunnyvale facilities.

-- Cost estimates for the center have varied widely over the last 3 years. They have ranged from $400 million to $1.8 billion. Currently the Air Force is stating $1.2 billion. We found no adequate support for that estimate.

These findings lead us to conclude that the Air Force, in lieu of firm requirements, has followed a development approach based on hasty achievement of short term goals. We still recommend that the Secretary of Defense take the following immediate remedial actions:

-- Designation of a single manager for military space development and operation.

-- Preparation of an overall plan for the military exploitation of space to include consideration of an interim Satellite Operations Complex in Colorado Springs. The plan should be supported by an adequate cost-benefit analysis of all viable alternatives.

It is our view that, until these actions are implemented, Air Force plans to build a complete space facility are not adequately supported and full funding of the consolidated center construction is questionnable at this time.

Mr. Chairman, this concludes our prepared testimony. We will be happy to respond to any questions the Subcommittee may have.

GENERAL QUESTIONING

1983 FUNDING REQUIREMENTS

Senator LAXALT. Thank you very much, Mr. Sheley.

Some of the points raised by GAO were basically management oriented, but there are others.

Is there anything then, or now in view of the creation of the Space Command, which would militate against our doing the requested funding in 1983? That is our fundamental inquiry in this committee at this point.

Mr. SHELEY. In our report we fully agree there needs to be a backup facility to Sunnyvale. I certainly agree with that portion of the funding.

On the Shuttle part, I have a little concern at this point. I have not seen an updated plan on how they plan to operate that portion of it. I reserve judgment until I do.

Senator LAXALT. That is purely only a matter of timing——

Mr. SHELEY. That is correct.

Senator LAXALT [continuing]. Am I correct?

Mr. SHELEY. You are correct on that and also what should be incorporated in it.

Senator LAXALT. Senator Schmitt, you have heard them all.

Senator SCHMITT. Mr. Chairman, my concern with the current design, as I have indicated, is that in the absence of policy it is very difficult to make plans and to make projections of the capacity that is required in a facility of this kind.

Again, I am separating, as we all have here, the creation of a backup. I don't mean replication; I mean backup to the Sunnyvale facility for satellite control. I am talking about the longer-term aspects of the Air Force involvement in space activity. That is why I keep coming back to the concern about computers, in that without being able to project capacity, without an overall policy and thought about what kinds of thing may be done, you really can't say that buying 3033's, which in the industry are considered obsolete, no matter what quality or price you might get, that you are going to be able to handle the kind of missions that may foreseeably come forward in the future and the numbers of missions that may have to be operated simultaneously.

SATELLITE CONTROL BACKUP

Senator LAXALT. Let me say for the purpose of the record that I gather, as far as GAO is concerned, as far as you are concerned, as far as various witnesses are concerned, we have no problem with backup on satellite control?

Senator SCHMITT. Only, Mr. Chairman, that that ought to be done on a modular basis. We ought to get that facility going. I would have no argument if the request for construction were to build that facility to get going on that and get it in place as fast as possible, even though it might be phased out and reintegrated into a new facility later on.

Senator LAXALT. Is it technically feasible to befurcate it?

Mr. ALDRIDGE. It is technically feasible but we feel it is appropriate to consolidate functions that are very similar, as the GAO reports in their report. They, in fact, would employ more consolidation, not less. We feel from an economic point of view that the consolidation of these facilities is the appropriate course.

Senator SCHMITT. It is very appropriate if you now what you want to consolidate. My question is, so we really know the things that we want to consolidate with the satellite control backup facility? I don't think we do. I think that we must be reasonably sure and I think in the space of a year we can be reasonably assured what kind the ultimate capacity is going to be required for this type of facility.

We have had arguments about this on other occasions, but I do not believe that the Air Force fully comprehends the capacity that this facility is going to have in our national defense.

Senator LAXALT. In connection with this preliminary funding we are talking about now, that we are not going to interfere with the overall program or timing, is there not a minimum threshold of the facility that we are fooling with, irrespective of what the ultimate capacity is?

Senator SCHMITT. You have to be sure you don't design constraints into that capacity at the very start.

Senator LAXALT. You are worrying about there being too many minimum restrictions?

COMPUTER SYSTEM REQUIREMENTS

Senator SCHMITT. Again, I get to the computer system they have selected. It is an old computer system based principally on business requirements, whereas the state of the art of computers in terms of rate of calculation, in terms of capacity of calculation, is way beyond the IMB 3033.

Senator LAXALT. Are you talking about a facility available to take the computer? We are not talking about equipment, are we?

Senator SCHMITT. They have made a decision about what computers they want for this facility.

Senator LAXALT. Are we looking into that at this point in terms of military construction?

Mr. ALDRIDGE. No, sir.

Senator LAXALT. When will that kind of determination be made?

Senator SCHMITT. Unless I am mistaken, that determination has been made, Mr. Chairman.

Mr. ALDRIDGE. General Randolph can respond. He has been following this.

STATEMENT OF BRIG. GEN. B. P. RANDOLPH

UPGRADING IBM 3033 COMPUTER

General RANDOLPH. Mr. Chairman, the basic computer that we have selected is in the 3033 family. The thing that we have done with the IBM folks, who are the builders of the computer, has worked out a procedure whereby the upgrades such as moving out to the 3081 are built into a portion of the design that we have.

Senator LAXALT. Have you been privy to this, Senator?

Senator SCHMITT. I have heard that statement, but again my position is that we ought to select the state of the art computer. The Air Force will argue that they want to stay compatible with software at Johnson. I don't think there is anything compatible in going to the state of the art computers to be compatible with what NASA has already developed.

On the other hand, the NASA facility is extraordinarily obsolete; they declined to fully upgrade their facility several years ago when we entered the Shuttle era. They did not even go to the state of the art at that time. Much of the software program is based on the Mercury program and the Gemini program. It is a whole generation of software.

What I would like to see the CSOC do is begin to lead this process so that NASA can begin to upgrade their system.

In addition, the discussion is that they are going to replicate the Johnson simulator system. I don't know what the ultimate cost of that will be, but, again, the Johnson simulator's concept, software as well as hardware, was old when I was training and we were having problems because it was old. That was 10 years ago.

What I am afraid is happening is that in an attempt to build in compatibility, Mr. Chairman, the Air Force has, in fact, constrained their potential for growth into the future to really take advantage of the consolidated space operation concept.

Senator LAXALT. What does the Air Force say?

General RANDOLPH. The selection of the computer was specifically designed not to do that. The growth that we have associated with the 3033 family, which is really part of the old 3075 family, is a modular kind of growth, as GAO suggested it should be. The computer evolved modularly and we are not talking about the basic main frame being obsolete. I think the basic main frame does everything we want it to do and we can add capacity in a modular fashion. That is one of the factors in selecting that family of computers.

Senator SCHMITT. May I ask GAO to comment?

Senator LAXALT. Yes.

Mr. SHELEY. As far as we can tell, the 3033 family of computers is rapidly growing obsolete. I have recently read in Computer News that despite IBM's best efforts to entice 3033 purchases, they are still being leased. Also since 1977, introduction prices have fallen by some 50 percent. I would agree with Senator Schmitt on this issue of obsolescence.

There is another matter you have to take into consideration when you talk about the computer. The computer drives your power source supply and power requirements such as the amount of air-conditioning that is needed in a particular facility that houses it. The more modern equipment requires considerably less power for such requirements as air-conditioning.

Senator SCHMITT. I think we could probably argue about computer selection all day. I just use it as a point of where I think there is considerable disagreement over that selection and whether you are talking about computers for the facility as a whole or computers for the simulator, that it does not appear to me that in the absence of some reason-

able space policy definition that it is possible to make that decision right now.

CSOC MISSIONS

Now, getting on to other subjects, the GAO has suggested consolidation of different missions in the CSOC would be cost effective, yet the Defense Department, as we have seen, disagrees, at least at this time.

Mr. Sheley, do you know why this is?

Mr. SHELEY. We have looked very carefully at the response they gave us. We think there is a certain degree of agreement with our position. Now, how far it goes is a matter of judgment at this point in time.

To quote specifically from their reply:

> While full functional integration theoretically could be more cost effective, it is not under the circumstances judged to be the most mission effective.

That is the position they have taken. I think they agree it can be consolidated. The question is how much they want to consolidate.

Mr. ALDRIDGE. We took the first step in consolidation. We could disband all the pieces out in the country. We felt this was one step of consolidation that was prudent. We feel that the functions that CSOC is performing are very defined functions of Shuttle launch and payload operation. It has nothing to do with command and control in the military sense that other functions which you would then have to consolidate, such as the space operations center that already exists in Cheyenne Mountain.

It is ridiculous to make CSOC larger than it needs to be to meet our requirements when we have these command functions which are already existing which are not that much related to what CSOC needs to do.

I have responsibility to the Secretary of Defense, the President, and the Congress to make a decision which is in the best interest of the taxpayers, and we felt we had made that decision. The computers meet our requirements; they are expandable to meet further requirements. We felt we have taken a prudent course in this thing.

If I were coming up here and giving you a design of a computer that far exceeded what we think we can ever project to be in the future, I think we would be criticized more strongly.

COMPUTER GROWTH LIMITATIONS

Senator SCHMITT. No, you would not, Mr. Secretary. If you could give this committee and the Congress a feeling that you were planning for the kind of growth that prudent space policy would dictate for the space program, I think you could easily be commended for going to the computer designed for growth.

The 3033 will have limits on what you can do.

Mr. ALDRIDGE. They are expandable to meet the requirements that we foresee.

Senator SCHMITT. I disagree with that on processing time and in terms of capacity.

Mr. ALDRIDGE. I cannot define what are the future requirements, what the future may hold. Are we going to have weapons in space? We do not yet know. If we do have weapons in space, that will be a command and control function not associated with the launch of the Shuttle program, which is what the CSOC will do.

Senator SCHMITT. You have already drawn constraints around a future space policy. I don't think you can do that.

Mr. ALDRIDGE. We are trying to define what the future space policy will be with regard to certain issues. We know the direction we are going on many issues.

Senator SCHMITT. You keep making my point for me, Mr. Secretary. While you are trying to define this, you are also trying to build a facility that will have a part to play in it.

CSOC FUNCTIONS

Mr. ALDRIDGE. No; the point is that CSOC will have two functions and only two functions. What additional space activities we will have will probably be located in a different area, not necessarily associated with CSOC.

Senator SCHMITT. You used the word "probably" and before you said there might be other integrated activities put into this. You also are really basing the Shuttle part of the facility, your concept of the Shuttle part of the facility, on current concepts of the use of the Space Shuttle.

In any future space policy you have to recognize the flexibility of this vehicle and what it may do besides what currently we plan to do with the Shuttle.

Mr. ALDRIDGE. I have noted we have provided for expansion of that CSOC capacity to take that into account.

Senator SCHMITT. We don't think you have provided for that.

Mr. ALDRIDGE. Then CSOC will become larger. It is not associated with the size of——

Senator SCHMITT. It is associated with the size of the land, powerplant, a computer concept associated with the simulator concept. It is associated with a lot of things. It does go into the construction aspect of this building. You can't divorce it. We saw it all through the construction of Johnson. Every time we thought we knew that we had reached the capacity, we knew what we wanted, we found we didn't have enough. That is going to happen to you, I guarantee that.

Mr. ALDRIDGE. Senator, if we delay, waiting for the ultimate answer——

Senator SCHMITT. That is not the suggestion. The suggestion is that you consider a different sequence of construction so that you can have a space policy that will control that construction over the long haul. You need a Sunnyvale backup; there is no question about it.

Mr. ALDRIDGE. That is why we have provided for that to be the best.

Senator SCHMITT. That must be compatible to whatever you do in the future.

Mr. ALDRIDGE. We believe that it is.

General WRIGHT. The systems that we are designing in terms of the building, the utilities, the land, we feel are expandable. We have looked at that. That is one of the driving criteria for the utility system and the building, land, for the design of the facility.

Senator SCHMITT. I would ask GAO to comment on whether they think it is expandable.

GENERAL ACCOUNTING OFFICE

STATEMENT OF NORMAN AUSTEN

Mr. AUSTEN. The current design and the last picture I saw drawn of it showed the 1 square mile pretty well filled with facilities, parking lots, some perimeter distance to the fence and the antenna field. If you increase the size of the antenna field you are not going to have room.

If they start building right up to the fence you are not going to have room. Not all of the land around this area is owned by the State of Colorado. Right now there are four contiguous sections of land which would give them room to grow and provide added security and tempest protection.

Mr. ALDRIDGE. I have flown over that site and let me tell you, it is 17 miles east of Peterson Air Force Base in the middle of nowhere.

Senator SCHMITT. So was Johnson.

Mr. ALDRIDGE. That was a slightly different part of the world.

Senator SCHMITT. It was ranchland.

Mr. ALDRIDGE. But the land that we have provided, the picture that has been painted was a full capacity showing all kinds of other satellite terminals in there, assuming you had expanded it for the future, not what the original phase is going to be.

Senator SCHMITT. You think a square mile is going to be sufficient?

Mr. ALDRIDGE. The land is about 50 percent utilized at this point. It is tempest clear and we do provide the necessary security. We have located the site so that it is not in a radiation path from Peterson Air Force Base. That is one of the criteria for selecting that site.

GROWTH DEVELOPMENT AROUND SELECTED AREA

Senator SCHMITT. Are you protected from the kind of growth that occurred around Johnson?

Mr. ALDRIDGE. The people who chose the land can comment on that.

General WRIGHT. I think you can take that argument infinitely. I don't know what that really means. How much land should we attempt to buy to really satisfy the concerns that you have? We feel that the section of land that is now available to us will adequately cover what we now have and cover growth in the future for the facility.

Senator SCHMITT. You don't have a policy on which to base that projection of growth?

General WRIGHT. As far as we know, the policymakers and the people developing the policy have assured us that the land is adequate and that we can expand to cover any future growth.

LAND SURROUNDING SITE

Senator LAXALT. How big a problem is this land? Is this private land?

General WRIGHT. It is State of Colorado land.

Mr. ALDRIDGE. You are talkling about around the site?

Senator LAXALT. On the perimeter, outside the 1 square mile.

General WRIGHT. I am not aware of any private land being adjacent.

Mr. AUSTEN. Immediately north there is a 40-acre parcel belonging to Mr. Ververs and he also owns the water rights on that land, all of it.

General WRIGHT. That is one direction only.

Mr. AUSTEN. Then he owns the two sections immediately to the north of the four State sections we are talking about. He stands to do quite well in the real estate business in the near future.

The point is that right now the Air Force could get that land from the State of Colorado at a reasonable price. If they wait until 3 or 4 years from now when they discover they suddenly need this and they are starting to build around there, that land will skyrocket and I guarantee you they are not going to get it for $50,000 a section.

LAND ACQUISITION PROPOSALS

Senator LAXALT. Are you recommending, Mr. Austen, in your testimony, that you double the land acquisition that is now proposed for purposes of expansion and additional security?

Mr. AUSTEN. Yes, sir.

Senator LAXALT. You are talking about 2 square miles?

Mr. AUSTEN. No; 4 square miles for this reason. It would also give you the high ground. The current piece of land selected is not the highest point in those four sections. The highest point is where they come together.

General WRIGHT. Mr. Chairman, I have no problem with going back and looking at the procurement of additional land, but if there is a requirement for additional land there is State land contiguous on two sides.

Senator SCHMITT. That assumes the State will be willing to sell once they see what the growth is.

The point is not so much the land they have but, Mr. Chairman, that there are open-ended aspects to the planning for this facility. I think we have to recognize that.

I think we also have to recognize the question of cost estimates. The GAO report stated the cost estimates for the CSOC have fluctuated significantly over the last 3 years. I certainly noted that. I got involved in it originally in questioning whether Colorado Springs was the place it ought to be. That decision is clearly under the bridge now.

COST GROWTH EVALUATION

GAO outlined some of the issues in their report. Could you evaluate this cost growth for me?

Mr. SHELEY. I can give you a little history of it.

General WRIGHT. Are you talking about construction cost estimates?

Senator SCHMITT. No; total cost.

General WRIGHT. The construction cost estimates have not changed.

Mr. SHELEY. I think in all fairness, the reasons for the fluctuation have been the budget decisions. In the summer of 1979 the Air Force told OMB that CSOC would cost $500 million. In the fall of 1979 the estimate was revised to $1.3 billion, adding factors such as software integration.

Senator SCHMITT. Are those construction costs?

Mr. SHELEY. That is total CSOC cost.

Senator SCHMITT. For some period of operation?

Mr. SHELEY. There is no lifecycle cost in it.

Senator SCHMITT. That is opening-door cost?

Mr. AUSTEN. These were total estimated development costs to achieve full operational capability.

Mr. SHELEY. In February 1980, the Air Force task force evaluated alternatives to hold the cost to $500 million. Reducing capabilities, they hit a range of $500 to $700 million.

In the fall of 1980 they deferred facilities to reach a range of $650 million to $1.2 billion.

In September 1981, the Air Force revised estimates to $1.2 billion for IOC in 1987 and with full cost by 1990 to be $1.8 billion. That is as far as we have gone with it.

Senator SCHMITT. Has there not been some question of just how the $1.2 billion figure has been arrived at, a change of $200 or $300 million?

Mr. AUSTEN. We are not sure exactly what that $1.2 billion represents. We are not sure whether that is IOC or full operational capability. In this year's request in the House they showed a $636 million final price tag. I think the numbers game gets away from you here. It is very hard to determine what they are doing at any given time. There is no overall plan that you can say, OK, you need these things and they price out like this, because every time you can nail them down on a price, something changes.

COST FLUCTUATIONS

Senator LAXALT. What accounts for those fluctuations?

Mr. ALDRIDGE. I don't know where he is getting the numbers. We have a plan. We know when we are going to bring it in; we know the equipment we are going to buy and the schedule.

Senator SCHMITT. What is the price tag?

Mr. ALDRIDGE. $1.4 billion.

Senator SCHMITT. When was that figure arrived at?

Mr. ALDRIDGE. September 1981, I was just informed.

Senator LAXALT. It has not changed since then?

General RANDOLPH. Mr. Chairman, the figures just quoted were a considerable mixture of apples and oranges. We have tried diligently to discuss these issues with GAO. For some reason they seem to misinterpret the numbers that we have provided.

The program director gave them a detailed explanation of the design, detailed discussion of the cost, detailed breakdown of where that money goes, and evidently either they have not understood those numbers or have mixed up the numbers.

We will be pleased to go back and do it all over again.

Senator LAXALT. I think it would be helpful if we had the $1.4 billion so that we could interrelate our portion of that and also so that we would be able to analyze the GAO overall objection.

General WRIGHT. Mr. Chairman, the construction costs we are looking at are $126 million.

Senator LAXALT. I understand it is only a portion of the $1.4 billion.

Mr. AUSTEN. The figures that we quoted from were provided us by the System Program Office of the Los Angeles Air Force Space Division. That was the source of the numbers that the gentlemen was asking about.

Senator LAXALT. You say they are talking about apples and oranges?

Senator SCHMITT. I have been involved in this thing almost 4 years. Harold Runnels, deceased, former Congressman, Second District of New Mexico, and others, were involved. Frankly, it has only been in the last few months that there has been a price that has been reasonably consistent and even that we just heard had been dropped to $1.2 billion. I guess the $1.4 billion is firm.

I think it would be advisable for this committee, as well as the Defense Subcommittee, to have a breakdown of those figures. It has fluctuated.

Part of it was that the original cost just included the Sunnyvale backup; then they began to expand it and there was considerable fluctuation.

At least from the congressional point of view we never until the last few months have heard any consistency in terms of what is it going to cost to open the doors of this facility. GAO may not be the only one that has looked at apples and oranges on this in order to sell the project, and also to get it at Colorado Springs. There were some things left out in the original economic analysis, as you well know, and there was some change in criteria along the line eventually which resulted in other sites being eliminated.

I would ask the GAO if they have any further comment on this computer situation?

Mr. SHELEY. No further comment.

COMPUTER FOLLOW-ON STUDY

Senator SCHMITT. As I understand it, you have been asked by Chairman Brooks of the House Committee to conduct a follow-on study on the computer; is that right?

Mr. SHELEY. That is correct.

Senator SCHMITT. What problems do you see with the CSOC using older Fortran and Jovial software language.

Mr. SHELEY. I think our principal concern is, by locking into the old language it may end up being unique within DOD, since DOD is trying

to standardize on the new high-level language Ada. If this situation does in fact occur, it will limit cost savings that can only result from standardization and certainly result in unacceptable software maintenance cost, because of the uniqueness of the CSOC system.

Senator SCHMITT. Does the Air Force have a comment or rebuttal to that?

Mr. ALDRIDGE. Yes, sir.

General RANDOLPH. Yes, sir. First of all, Ada is not simply the language. Ada is a design tool, a design technique. Ada compilers are currently being developed so that other source languages can be compiled in the Ada language. Those compilers are not yet complete for DOD use. We are in the process of working that out.

The key thing that Ada provides is a standard design technique for software and we are using that standard design technique as part of our CSOC software buildup.

Mr. SHELEY. There are compilers on the market. They are Ada compilers, but they have not been certified for DOD use.

General RANDOLPH. That is correct.

Senator SCHMITT. Then your position, General, is that even though you do use an older version of language, software language, that it can be made compatible with the Air Force decision?

General RANDOLPH. Yes, sir.

Senator SCHMITT. Is any cost associated with doing that?

General RANDOLPH. There will be cost if you are going to change language. We have not yet made a decision whether that is an approved course of action. The key thing is that the standard design that Ada affords is being used and that is being implemented as part of our design technique. We will make the change downstream when compilers are available.

COST OF STATE OF THE ART COMPUTERS

Senator SCHMITT. Have you looked at what the cost will be to go to a state of the art computer system?

General RANDOLPH. Yes, sir, we have looked at the cost. I don't have the figures handy, but I think the key point that the Secretary made was that there is no requirement to do that.

Right now we have about 50 percent of the computer capacity of those systems for our projected use in the late 1980 time period, so there is a 50-percent growth capability that is already built in.

Senator SCHMITT. Our problem is that the Air Force and I have different visions of what that growth is going to be and what the calculated capacity and actual rate is going to have to be for future missions. I don't think the Air Force realizes how determined our principal adversary is to dominate this new ocean of space.

General RANDOLPH. We are very sensitive to that. We also have a modular growth capability built into it.

Senator SCHMITT. You have limited yourselves by not going to the state of the art computers. You may be able to put more in there, but there is an inherent capability limit on what you can do by just adding the 3033.

General RANDOLPH. No, sir.

Mr. ALDRIDGE. You and I don't disagree on our adversary and our need to exploit military operations in space to the fullest. There is absolutely no disagreement.

Your assumption is that if we do expand our role in space to some future capability, it will be done in the CSOC. That is why I disagree.

Senator SCHMITT. My assumption is that it may be done there and, therfore, you have to be ready for it, Mr. Secretary.

Mr. ALDRIDGE. But the functions that the CSOC is planned to do are not those functions that will call for us to use military operations at the level you are talking about. you are talking about weapons in space and a very full-blown military kind of capability. That is not the function of CSOC and was not intended to be.

If we did make a decision to do that, it will be done under some type of military operations command, not the function that CSOC is planned to perform.

Senator SCHMITT. I believe the Air Force continues to totally underestimate the utility of the Space Shuttle in their operation.

Mr. ALDRIDGE. Sir, we do not.

SUNNYVALE FACILITY REPLICATION

Senator SCHMITT. Mr. Sheley, DOD states that replicating the Sunnyvale facility without proceeding immediately with the whole CSOC is inconsistent with GAO's assertion that CSOC should be fully integrated.

Will you give us your view in more detail?

Mr. SHELEY. Building an interim, that is, a minimal configuration, backup facility to begin with at Colorado Springs, and then phasing out this interim facility as the new, fully integrated CSOC came on line would be the most cost effective approach. Simply put, use replication of only what is needed now and modularly replace the system.

The modular approach has been around for a long time. For some reason we were unable to ascertain why the Air Force has consistently rejected it.

Senator SCHMITT. Mr. Secretary, do you wish to respond?

Mr. ALDRIDGE. Yes, sir. There is inconsistency in these arguments. GAO says we don't need to build the CSOC operation because we have an interim facility at Johnson, yet they are proposing we do an interim facility to be phased out when we get our full capacity.

Mr. SHELEY. Our position is that the interim facility would only be a replication of the SOC portion of CSOC. The capabilities at Johnson relate to the SOPC part of CSOC. The location of the Sunnyvale facility on the earthquake fault and ease of sabotage of that facility require that a backup satellite operations facility be built.

Mr. ALDRIDGE. We cannot operate out of Johnson after 1987. That is more severe; that is a fact.

JCS CONTROLLED MODE OPERATION

Senator SCHMITT. Mr. Sheley, you have stated that the controlled mode operation at JCS will meet DOD needs long enough for them to properly plan and build a CSOC. The Air Force, on the other hand, states that six to eight missions a year by 1987 will saturate the controlled mode. Can you explain this difference?

Mr. SHELEY. The Air Force uses a mission model that projects six to eight dedicated military Shuttle flights by 1987. Since the Air Force, as far as we can determine, has only scheduled approximately half of all Shuttle flights, this would mean that the Shuttles would have to fly at least 12 to 14 missions per year by 1987.

Given the current rate of NASA funding and delays in Shuttle deliveries, we believe that this is an extremely optimistic projection by the Air Force.

We know that the Challenger—flight 99—will soon be operational and that flights 103 and 104 could be available by 1987.

The Air Force projects that over six to eight missions would saturate the controlled mode, but it does not appear likely that this will occur. Of course, if the Air Force were committed to purchasing its own Shuttle fleet, these figures could radically change.

Right now, the number of planned Shuttle flights and the availability of expendable launch vehicles do not give any impetus for immediate replication of the Johnson Space Center facility.

Mr. ALDRIDGE. The DOD has priority on all the Shuttle flights. We have a mission model which is currently being planned; it requires us to meet the flight rate that GAO has stated. If the orbiters and the turnaround that we think can be achieved, and four orbiters are currently planned, that we can dump and push off civil payloads to meet national security missions.

Our mission model is firm. NASA's may not be. We feel strongly in order to meet our national security requirements that we will exert the priorities necessary to meet our national security launch requirement and that the mission models therefore are very firm for DOD.

Senator SCHMITT. Is that 24 flights per year model?

Mr. ALDRIDGE. We believe we can; it really does not make any difference, in the sense that I believe it is 24 flights per year on the orbiter. If the orbiter turnaround is 90 days rather than 30 or 60 days, we will exercise the priority where we will have to launch on a specific date.

Whether or not we have four or five orbiters really is not important. We feel our mission model is very firm, that we need the launch. We already have planned those launch dates for replacement satellites.

Barring some unforeseen circumstances, that is what we are planning to do. So, we feel very strongly that the saturation will be exceeded based on DOD only and that if there is any problem in turnaround, the civil will suffer.

COSTS OF MILITARY SHUTTLE FLIGHTS

Mr. AUSTEN. I would like to ask the Secretary a question: Who is picking up the bill for all those military Shuttle flights?

Mr. ALDRIDGE. The Department of Defense.

Mr. AUSTEN. Yet the Shuttle, I understand, is funded and operated by NASA; is that correct?

Mr. ALDRIDGE. That is correct.

Mr. AUSTEN. What is the agreement as to the prioritization of flights? Is there written agreement that states under certain circumstances you preempt?

The Defense Communications Agency can seize all the telephones in the United States under certain conditions. When do you preempt civilian flights, especially those contracted with other nations?

Mr. ALDRIDGE. We can preempt at the time we feel the national security overrides the civil payload requirements.

Senator SCHMITT. Is that a secretarial decision or Presidential?

Mr. ALDRIDGE. It is my understanding the agreement in 1977 makes that statement. It is clearly the understanding between the Department of Defense and NASA.

Senator SCHMITT. I realize we have talked a lot about DOD having priority, but how is that exercised?

Mr. ALDRIDGE. If there is a conflict, we try to work out the conflicts on a given payload. We are having one right now with NASA. If we feel the national security mission is overwhelming, there is a requirement for some reason to launch on a given time, we will exercise that priority.

Senator SCHMITT. Can NASA appeal?

Mr. ALDRIDGE. They can appeal.

Senator SCHMITT. To the President?

Mr. ALDRIDGE. They have to go to the President in this particular situation; however, what we really try to do is work it out. If we can avoid a slip for a few weeks or a month in order that the orbiter will become available and it is not of higher importance to the national security mission, we will, in fact, compromise our position.

There are some launches that are absolutely critical and we will exercise that priority if we have to. NASA fully realizes that and they fully support that position.

CSOC PROGRAM MANAGEMENT PLAN

Senator SCHMITT. Mr. Secretary, I gather from the discussion that there is some kind of CSOC plan now, as a document; is that correct?

Mr. ALDRIDGE. I believe that is correct.

Senator SCHMITT. Is it something that the committee could request to have a copy?

Senator LAXALT. The committee already has.

Senator SCHMITT. Do we have that plan as a document?

General RANDOLPH. We have not submitted it.

Senator LAXALT. I think we should have the overall plan.

[The information follows:]

Consolidated Space Operations Center (CSOC)

Program Management Plan

1.0 PROGRAM SUMMARY AND AUTHORIZATION

1.1 REQUIREMENTS

1.1.1 BACKGROUND

National Space Policy Presidental Directives PD NSC-37 (TS), 11 May 1978, and PD-NSC-42 (S), 10 October 1978 described the requirement for secure, survivable space systems that will meet DOD operational requirements.

The requirements for DOD satellite and shuttle control capabilities were set forth in two Mission Element Need Statements approved by SECDEF on 29 September 1979. The major needs were to reduce vulnerabilities (natural disasters and hostile acts, but not general nuclear war) for secure control of DOD Space Shuttle missions, to address the limitations imposed on the DOD operational space capability by operating from the interim facility at the Johnson Space Center, and to construct a DOD controlled capability for command and control of military space operations, recognizing our national commitment to the Space Shuttle as the sole access to space operations..

In late 1979, the Secretary of the Air Force directed the initiation of activities leading to the development of CSOC. In early 1980, the Commander, Air Force Space Division, established a Task Force chaired by MGen Kulpa, and staffed with participation from across the Air Force to define a development program, the probable costs, and to recommend a priority for attaining the directed mission objectives.

The priorities of the Kulpa Task Force were to provide the site preparation and facilities first. Second was development of the communications for connectivity to the on-orbit satellites and Space Shuttle. Next was development of four Mission Control Centers (MCCs) to satisfy satellite operational requirements. The next CSOC priority identified by the Kulpa Task Force was for Space Shuttle mission control consisting of a Flight Planning Element, Flight Readiness and Validation Elements, and two Flight Control Rooms. The four MCCs and two Shuttle Flight Control Rooms with supporting facilities and communications represent the defined requirement for the operational capability needed. There is no firm requirement for more than four MCCs; however, consideration for growth beyond four MCCs was the final priority of the Kulpa Task Force.

Current HQ (AFSC) Program Direction 35130-81-9 and HQ (USAF) Program Management Directive R-S 0042(2)/PE 35130F were released in December 1980 to initiate the development and acquisition of a Consolidated Space Operations Center, recognizing the significantly enhanced capabilities for conducting space launch and orbital operations that such a center would provide. The major capabilities of the CSOC were to include satellite tracking, telemetry data analysis, command and control services for orbiting satellites and a secure dedicated facility from which to plan and conduct military Shuttle missions.

In late 1981 additional endurance was proposed to the common user network managed by the Air Force Satellite Control Facility (AFSCF). The proposal entitled Satellite Control Capabilities Integration (SCCI) received wide Air Force support. The major elements consisted of the AFSCF, the

Defense Meteorological Systems Program (DMSP), the Global Positioning System (GPS), and CSOC.

The AFSCF exercises command and control via a network consisting of the Satellite Test Center (STC) and seven globally deployed Remote Tracking Stations (RTSs). Some have dual command and control capability while others are single stations.

DMSP is managed and operated by the 4000th Satellite Operations Group at Omaha, NE under the command of the Strategic Air Command and operates through two ground tracking stations at Fairchild AFB, WA and Loring AFB, ME.

The GPS Master Control Station (MCS) was planned to be installed at Fortuna, ND. It has three Ground Antennas (GAs) that would be deployed somewhat equally dispersed around the globe.

For satellite control, CSOC is being developed as a dual control node in the Air Force common user network.

The SCCI plan is to integrate these satellite control capabilities by physical colocation and communications internetting for greater endurance. One system at each RTS (except Thule, Greenland) will be modified to perform the GPS as well as the normal network functions. The programmed second system for Oakhanger, England will be diverted to the CSOC site providing a mid-CONUS RTS. (The dual capability at Oakhanger is thus delayed). The GPS Master Control Station (MCS) will be colocated with the CSOC and a back up capability provided at the Satellite Test Center. The three GPS Ground Antennas (GA) will be modified to perform the common user network functions as well as the GPS functions, providing a more durable GPS. A back up tactical commanding capability for control of the DMSP was to be developed at CSOC to complement the present control center at Omaha, NE. More recent direction requires this capability to be installed at Fairchild AFB, WA.

Since the current PMD does not address the SCCI concept, an updated PMD (PMD No: R-S 0042(3)/PE 35130F) is being prepared. It will direct the Program Office to coordinate planning and acquisition activities originating in CSOC with the SCCI participants to minimize duplication of efforts and to maximize the interoperability of the CSOC and other programmed elements of the Space Control Network, e.g., DMSP, GPS, Defense Support Program (DSP), and Space Defense Operations Center (SPADOC) as well as the AFSCF and Space Transportation System (STS) and new systems that emerge.

The SCCI plan will be implemented in the following manner:

a. A mid-CONUS tracking station will be collocated with CSOC. This RTS will be developed and acquired by the AFSCF (PE 35110F) starting in FY 84 with IOC planned for 1985. It will be compatible with the Data Systems Modernization (DSM) architecture of the AFSCF and operate with both CSOC and the STC.

b. A new tracking station at Thule will be developed and acquired by the Satellite Control Facility (PE 35110F) starting in FY 84 with IOC planned for 1985. The Thule RTS will be DSM compatible and will have direct connectivity to the 4000th Satellite Operations Group at Offutt AFB, NE to meet DMSP support requirements for commanding and data readout. A backup for the 4000th will be provided at the DMSP Command and Readout Station (CRS) at Fairchild AFB, WA. When the Thule antenna is operational, the CRS at Loring AFB, ME will be closed.

c. An additional DSM tracking station will be deployed at Oakhanger, UK (PE 35110F) starting in FY 86 with IOC planned in 1988.

d. An enduring satellite control capability based on elements of the Air Force Satellite Control Plan which embraces key features of the SCCI will include an internet capability between GPS ground antennas and SCF

remote tracking stations (PE 35110F and PE 35165F); a backup GPS MCS at the STC (PE 35165F); development and production of a transportable/mobile ground station to support GPS and satellites supported by SCF (PE 63438F and PE 35110F); an advanced telemetry, tracking and commanding (TT&C) capability to increase bandwidth capacity and reduce susceptibility to jamming (PE 35110F); adaptation of satellite cross links to support TT&C requirements (PE 35110F); and technology development to provide generic autonomous satellite control subsystems (PE 63401F).

Direction for implementation of these capabilities will be provided in PMDs for each program.

1.1.2 PRESENT CAPABILITIES

DOD satellite operations are presently controlled from the Satellite Test Center (STC) in Sunnyvale, California. The STC is an element of the Air Force Satellite Control Facility (AFSCF) which also includes Remote Tracking Stations (RTS) at seven sites around the world and other elements.

Space Shuttle flights are controlled by NASA's Johnson Space Center (JSC) in Houston, Texas. Portions of JSC are being secured to control classified DOD flights up to the SECRET level for an interim space shuttle flight capability The program providing this early capability is called the Controlled Mode.

These existing capabilities have limitations and vulnerabilities. Both locations are susceptible to natural disturbances (earthquakes, hurricanes) and adversary activities (jamming, sabotage); in addition, the capacity of the Controlled Mode operations to support Shuttle activities is limited to six-eight flights per year, an amount projected to be exceeded in 1989.

1.1.3 SPECIFIC REQUIREMENTS

In general CSOC is required to provide a dual-node capability with the STC and JSC to control DOD satellite and Shuttle operations respectively. An initial operational capability (IOC) for satellite operations is required in the 1985-86 time frame to provide a GPS Master Control Station and a back up capability to compensate for the loss of the Santa Monica back up capability which will be lost when the DSM is complete.

An IOC for Shuttle operations is required in the late 1987 period in order to have an autonomous capability able to handle missions exceeding the Controlled Mode capacity in the 1989 period. The late 1987 IOC is necessary so that CSOC can participate jointly with JSC in a series of flight following mission operations in order to build confidence in the certification of the CSOC Shuttle operations.

The resulting CSOC capability will provide an interoperable system with enhanced endurance and capacity when combined with the capabilities resident at the STC and JSC.

In order to eliminate or reduce vulnerabilities and limitations in the current system, the following additional requirements apply to the CSOC:

CSOC will be required to provide for control of Shuttle flights from a secure military station, permitting handling of missions beyond SECRET.

CSOC will be required to provide for improved DOD responsiveness in times of national crises through a direct military-chain of command. As a by-product, CSOC will simplify NASA's space operations which depend on public openness and cooperation with foreign countries.

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CSOC will eliminate single-point control nodes for both satellite and shuttle operations as required by Presidential Direction.

CSOC will be required to reduce vulnerability by providing satellite operations at a central CONUS location, with reduced urban congestion, traffic thorough-fares, and natural threats (earthquakes, hurricanes) and reduced access to maritime threats and alien borders.

CSOC will be required to reduce the loading on JSC flight planning, readiness, and control facilities as its capacity limit is approached.

CSOC will be required to have its own training capability, including simulators, for DOD flights.

CSOC will combine in a single facility both satellite and Shuttle operations optimizing communications between both segments and minimizing acquisition and operations costs by sharing common expenses and capabilities. It is imperative that the facility be built as a single facility in order to realize these benefits. Substantial program cost growth and impact to on-going activities would result with an incremental facility construction.

CSOC will be required to be interoperable with the STC and JSC Controlled Mode operations. As a by-product, design, development and operations costs will be minimized by functional replication of hardware and full-replication of software to the maximum extent practical.

1.2 OBJECTIVES

The major objective of CSOC is to enhance DOD space operations capability, security and survivability in accordance with Presidential Directives/National Security Council PD/NSC-37 and PD-42.

The CSOC acquisition program will:

a. Acquire a satellite control capability similar to that being designed by the Data System Modernization (DSM) Program for the STC; thus the AFSCF satellite-operations capability augments CSOC providing an alternate control node for this operation.

b. Acquire a shuttle control capability similar to the one that will exist at NASA/JSC during the Shuttle mature operations time frame, thus providing DOD a direct military shuttle-control capability with improved responsiveness in time of national crisis.

c. Accommodate security levels higher than SECRET for shuttle flights while providing an alternate node for NASA shuttle flight control.

d. Acquire a facility and integrated communications and support equipment to support shuttle and satellite operations.

e. Acquire Shuttle flight planning and flight readiness systems, including capabilities for selected training of shuttle crews and support personnel.

f. Provide interoperability with the STC and JSC for mutual backup in case one center becomes inoperative.

g. Assist in preparing Air Force sponsored personnel to manage CSOC operations and provide for the recurring operation and maintenance of the facility.

1.2.1 RECOMMENDED APPROACH

The recommended approach to the design, development, and acquisition of CSOC will take maximum advantage of existing designs and expertise. In order to minimize life cycle costs (LCC), software replication will be maximized wherever practical. Within the constraints of software replication, emphasis will be applied to reduce manpower intensive operations. New developments will be minimized; off-the-shelf procurements will be maximized. The use of proven technology and the integration of present expertise will yield a reliable system at minimum cost. Attempts to combine satellite and shuttle operations to simplify operations and maintenance and reduce costs will be consciously considered. Trade studies will be an integral element of the entire program constantly considering the relative merits of off-the-shelf vs new technology, new software vs replication, current design vs manpower savings, etc. in an attempt to get the best system at minimum cost.

The satellite operations will be procured principally as fixed-price options on the existing Data System Modernization (DSM) contract. The DSM is an AFSCF program to modernize its aging hardware and optimize its software. A feature of the DSM program is a substantial reduction in manpower at the AFSCF RTSs. By procuring the satellite options this way, a minimum cost and highly modern system will result which will be inherently interoperable with the STC.

The Shuttle operations will be designed based upon the best features of the existing Controlled Mode operations. Heavy reliance upon the expertise that resides with NASA will be used. NASA has conceptualized, prototyped, designed, developed, operated and maintained the present day capability at JSC. The Air Force plans to take maximum advantage of this. The resulting Shuttle operations at CSOC will be strongly influenced by a joint venture between the Air Force and NASA designed to assist in the definition of a Shuttle system which functionally replicates the hardware at JSC and replicates its software to the maximum extent possible. The result will be a least cost, highly reliable system which emphasizes minimum manpower operations and interoperability between CSOC and JSC. The design will be an upward compatible one, permitting procurement of the most up to date hardware at the time when acquisitions are made with minimum software and system interface impacts.

A communication segment will be acquired to provide inter-communications between the satellite and shuttle operations, and external connectivity with the STC, JSC, the White Sands Ground Terminal, NASA's Goddard Space Flight Center (GSFC), and the launch complexes at the Kennedy Space Center (KSC) and the Vandenberg Launch Site (VLS). Inherent in this communications network will be access to the existing RTSs, the GPS GAs, and the Tracking Data and Relay Satellite System (TDRSS).

A network control segment for scheduling and controlling operational resources will be partly procured as an option to the DSM contract and partly as a portion of the Communications contract.

The facilities will be procured through the Army Corps of Engineers in a two year appropriation. The design of the facilities will be developed in close liaison with the user community. Once established, the requirements will be closely controlled by a Requirements Control Board. The facilities contract will have strong Program Office visibility through the formation of a team including the Corps of Engineers, the Air Force Regional Civil Engineers (AFRCE), the CSOC site activation task force (SATF), and the Program Office. The primary role of this team will be to control cost growth and monitor change traffic.

Other support elements will be procured as parts of the aforementioned contracts or as stand alone procurements. Examples of support elements are a timing subsystem (procured on communications contract), an uninterruptable power supply (UPS) (procured on communications contract), weather station, security, and a Technical Data Center (procured on the CSOC Integration Support Contract).

As is evident by the number of functionally separate elements of CSOC, the integration of these elements into a synergistic whole is a substantial challenge. In order to accomplish this economically and expeditiously, a CSOC Integration Support Contractor (CISC) will be used. The CISC is be a five year contract that began in June 1982. In addition to assisting in the integration of the various elements, the contractor will be responsible for activating the CSOC, supporting the testing and certification, assisting the Program Office in the planning and acquisitions, including development of a Configuration Control system and the aforementioned Technical Data Center-a repository for documentation, including software.

The Shuttle Mission Simulator will constitute a major procurement. It is required primarily to support training of the flight operations support personnel (FOSP) and secondarily to support flight validation. Eventually, it could be used to train the flight crew, a task presently accomplished at JSC. The determination of whether to procure this as a line item on the shuttle procurement or as a separate acquisition will be made following the NASA Air Forcejoint venture scheduled for completion in April 1982.

1.2.2 SUGGESTED OPTIONS

The only alternatives to the current approach are not considered viable. One could disregard the on-going DSM effort and procure a different system, tailored to integrate with the CSOC shuttle operations. Or conversely, the enormous investment in NASA JSC software development could be ignored while a shuttle system tailored to interface with the DSM system was procured. The current approach which takes maximum advantage of the investment in the JSC and DSM systems while trading off these designs where practical to minimize Life Cycle Cost (LCC) is considered the only viable option.

1.3 SYSTEM DESCRIPTION

The Consolidated Space Operations Center (CSOC) is a secure Air Force facility dedicated to the planning and control of DOD space missions. It comprises a Satellite Operations Complex (SOC) and a Shuttle Operations and Planning Complex (SOPC), plus required support capabilities to support SOC, SOPC, and Collocated Program Elements (CPE). The Collocated Program Elements include an Advanced Remote Tracking Station Element ARTS/E, and the GPS Master Control Station Element (GPS/E).

1.3.1 SOC SEGMENT

SOC supports the preflight, flight and postflight operations necessary to satisfy DOD satellite mission objectives using computer and display equipment, data distribution equipment, software, and procedures. SOC is the physical and functional equivalent of the Satellite Test Center (STC) Command and Control Segment (CCS). SOC supports SOPC in planning, scheduling, and preparing the launch of payloads on the Space Shuttle Vehicle (SSV), the operations of payloads within the SSV (Sortie Missions), deployment of upper stages or free-flyer satellites, or retrieval of payloads from orbit. SOC provides support to SOPC for several SSV Flight Operations functions.

1.3.2 SOPC SEGMENT

SOPC supports the preflight, flight, and postflight operations necessary to satisfy DOD SSV payload mission objectives. SOPC comprises computer and display equipment, data distribution equipment, software, and procedures to perform its assigned functions.

SOPC supports SOC and JSC in planning, scheduling, and preparing the launch of payloads on the SSV, the operation of payloads within the SSV, deployment of upper stages or free-flyer satellites, or retrieval of payloads from orbit.

1.3.3 COMMUNICATIONS SEGMENT (CS)

The CS consists of the communications circuits, RF to baseband, and recording equipment required for data, voice, video, teletype, and facsimile communications internal to CSOC and externally between CSOC and the AFSCF network, the NASA networks (e.g., NASCOM, TDRS) and other government facilities. The CS utilizes government and commercial surface and satellite communication services to perform its assigned functions. In addition it provides services for the CPEs.

1.3.4 FACILITIES SEGMENT (FS)

The FS consists of all centralized real-property installed equipment, grounds, buildings, utilities, grounding, environmental controls, storage, fencing and physical security systems, roadways, parking, and like accommodations required for CSOC and CPE site operations.

1.3.5 SUPPORT SEGMENT (SS)

The SS consists of a timing subsystem, a Weather Support Unit (WSU), a Technical Data Center (TDC), an Uninterruptable Power System (UPS), a Security Control Subsystem, and an Operational Command Center.

1.3.6 VALIDATION SEGMENT (VS)

The VS validates the CSOC mission configuration and trains and certifies personnel to support specific Shuttle and spacecraft missions. The VS comprises the CSOC Simulation System (CSS) and the Training Equipment System (TES).

1.3.7 NETWORK CONTROL SEGMENT (NCS)

The NCS consists of the hardware and software required to schedule AFSCF, CSOC, and NASA range and other resources required to support CSOC operations, to control AFSCF and CSOC resources and to service associated CPEs. The NCS functions similarly to and is interoperable with the Range Control Complex of the STC but has additional capabilities for controlling internal CSOC resources and shuttle operations resources.

1.4 PROGRAM OVERVIEW

The PMD directs full scale engineering development, construction, systems acquisition and initial operation of a Consolidated Space Operations Center. The following excerpts from the PMD state what the CSOC program will accomplish.

a. Construction of the CSOC as a Priority A security facility to include technical space, engineering, administrative, and support areas, antenna support buildings and power plant as required. Provisions for red and black power, signal, and grounding systems shall be in accordance with NACSIM 5203.

b. Conduct systems engineering analysis to determine the degree of integration between CSOC elements. In particular, this analysis will determine the appropriate degree of functional and physical integration between satellite control and Shuttle control elements in the areas of training, resource scheduling and control, ADP, communications, displays and personnel. Measures of merit for this analysis will include mission effectiveness, economy, efficiency and flexibility within the constraints of security and interoperability between CSOC and both STC and JSC. The results of this analysis will be reflected in the baseline configuration for CSOC.

c. Equip the satellite control element of the CSOC with techical equipment and software based on that being developed under the SCF

Data System Modernization (DSM) program (PE 35110F). Provide automated space control network (SCN) scheduling and control systems to allow these functions to be performed at either CSOC or the STC.

d. Equip the Shuttle control element of the CSOC with technical equipment and software based on the design resulting from engineering analysis and tradeoffs.

e. Integrate the CSOC into existing command and control networks for satellite control (currently with a single control node at the Air Force Satellite Control Facility's Satellite Test Center) and for Space Shuttle Control (currently NASA's Ground Space Tracking and Data Network). Provide facility and network communications interfaces between the network operating elements at the CSOC, the SCF remote tracking stations, the Satellite Test Center, Johnson Space Center, Eastern and Western Space and Missile Centers, 4000th Satellite Operations Group, Space Defense Operations Center (SPADOC), Air Force Global Weather Central, the NASA communication system (NASCOM), DOD and NASA control and data relay systems including the Tracking and Data Relay Satellite System (TDRSS), and other satellite command control elements as required.

f. Conduct analysis to determine the appropriate degree of interoperability and standardization between the CSOC and both STC and JSC. Provide CSOC technical interfaces to achieve this interoperability.

g. Conduct engineering analysis and trade studies to determine appropriate simulator systems to support requirements for Shuttle operations, satellite operations and Payload Specialist training. Acquire a CSOC simulator system as determined by this analysis and directed by HQ USAF.

h. Conduct a system engineering analysis to determine the appropriate degree of mutual support, interoperability and standardization between the SPADOC, CSOC and other elements of the SCN. This mutual support can include (but not be limited to) sharing of technical and support facilities (e.g., ADP, communications), and sharing of personnel and related functions (e.g., computer programmers, computer algorithms). Develop appropriate interfaces with the SPADOC in the areas of status, space asset protection measures, and other information or data to be determined by specific Memoranda of Agreement between ADC and AFSC and associated Interface Control Documents.

i. Provide CSOC facilities, emergency power, and secure communications to accommodate the Global Positioning System (GPS) Master Control Station (MCS) at CSOC. The MCS will be located within the CSOC facility; mission equipment will be required and installed by the GPS program (PE 35165F).

j. Provide a backup capability for operational satellite programs transitioned to Data System Modernization (DSM) configuration at the Satellite Test Center. The initial backup capability should support operations (IOC) consistent with the first programs transitioned to DSM at the STC in the mid 1985 timeframe.

Operational capability milestones for CSOC are defined as follows:

Satellite Operations Complex: IOC for the SOC is planned for late CY 1986. IOC will consist of four Mission Control Complexes and associated network scheduling and control capability to provide satellite tracking, telemetry and commanding support to assigned programs. Backup for high priority satellite capability is demonstrated to continue network functions in support of all critical satellite operations in the event of STC loss.

Shuttle Operations and Planning Complex: IOC for SOPC is planned for late CY 1987. IOC will consist of a Flight Control Room and

associated network scheduling and control capability to perform flight planning and control of DOD Shuttle missions. NASA would flight follow initial missions in a "hot shadow" mode from Johnson Space Center. FOC will occur when the capability is demonstrated to plan and conduct all DOD Shuttle missions including support of simultaneous Shuttle flights.

1.5 PROGRAM DIRECTION SUMMARY

The following documents provide direction and guidance for the CSOC program.

a. PMD R-S 0042(2)/PE 35130F - 4 Dec 1980

b. PMD R-S 0042(3)/PE 35130F - in review cycle

c. Mission Element Need Statements, DOD Shuttle Control Capability(S) and Satellite Control Capability(S), both approved 29 Sep 79.

d. Presidential Directives NSC-37, National Space Policy, 11 May 1978 (TS), and Civil and Further National Space Policy, 10 Oct 78 (S).

e. Consolidated Space Operations Center, Task Force Final Report, Dec 80.

1.6 PROGRAM PRIORITY AND RESPONSIBILITIES

USAF Precedence Rating 2-7 and Force Activity Designator II will apply to CSOC. For direct support of launch and orbital operations, the CSOC will assume the priority of the payload should it possess a higher precedence.

The relationships and responsibilities of supporting organizations and the user community are discussed in Section 3.

2.0 INTELLIGENCE

2.1 IDENTIFICATION OF THE THREAT

Refs 2.4.a and 2.4.b below provide Air Force approved threat data related to the CSOC. Key threats, applicable to the CSOC, are:

a. Information collection by hostile countries against the CSOC or the programs it supports.

b. Physical threats to the CSOC and its support structure (including logistics).

c. Electronic warfare threats against the CSOC communication links, including communications relays.

d. Nuclear threats to the CSOC, including direct and collateral damage.

2.2 IDENTIFICATION OF RELEVANT FOREIGN TECHNOLOGIES

a. Space Systems Command and Control.

b. Threat Capabilities against US Space Systems.

2.3 INTELLIGENCE SUPPORT REQUIREMENTS

The specific intelligence support that will be provided for CSOC will be in the following areas:

a. Threat data will be incorporated in the Threat Environmental Description (TED) for Space (Ref 2.4.a below) in sufficient detail to permit interactive analysis.

b. A focal point will be established at SD/IN to support the program office on intelligence matters.

2.4 REFERENCE DOCUMENTS

a. SD 140UF-02-80, Threat Environment Description for Space (U), SD/IN, December 1980 (with changes (SECRET-NOFORN-WNINTEL-RESTRICTED DATA)

b. SAMS-CR-12-02-77 (S), Threat Assessment Report - Space Transportation System (U), SAMSO/IN, November 1977 (SECRET).

3.0 MANAGEMENT APPROACH

The overall management approach is reflected by this Program Management Plan (PMP) which provides guidance to program office personnel. Where implementation details are required, Mission Control Program Office (SD/YVO) operating instructions have been generated. Consequently there is a direct relationship between the general management principles stated in the PMP and the specific details required to implement these principles through the mechanism of YVO Operation Instructions.

The PMP reflects management principles which emphasize cost control, schedule preservation, and performance accomplishment. Emphasis will be placed on an "up-front" and iterative systems engineering approach. As various iterations cause the program strategies to change or be modified, these changes will be reflected in updated PMP versions.

A Cost Center Manager approach will be employed to establish a management strategy and a budget for identifiable elements of CSOC. Responsibility for integrating individual manager's inputs rests with the System Program Director. Each manager will defend and monitor his own budget, including his management reserve. His approach will be that of a "zero sum" in that each cost overrun must be off-set by a compensating cost reduction. This delegation of fiscal awareness will generate in the Cost Center Managers many of the positive features engendered by the management by-objectives approach (reference YVO Operating Instruction 800-10).

3.1 TECHNICAL PERFORMANCE ASSESSMENT

Technical performance assessment will be accomplished by establishing measurement critieria and observing performance against those criteria.

The CSOC system will be baselined in a System Specification. Each of the segments which added together constitute the entire CSOC system will be baselined in their respective segment specifications.

These specifications will become compliance documents for the RFPs and will become a part of the contracts which, in turn, will constitute an element of the baseline requirements.

Interface control documents, test plans, and procedures which as CDRLs become products of contractural efforts will also establish and validate the baseline.

All requirements will be controlled by a Requirements Control Board (reference YVO Operating Instruction 800-3). Once a baseline is established formalized Configuration Control Board procedures will be applied (reference YVO Operating Instruction 800-11).

Contractor performance will be assessed during status and design reviews and by means of CDRLs such as C/SCSC or C/SSR reporting, PERT chart monitoring and Critical Path assessments.

Program office performance will be measured against budget and schedule baselines and reported to all management levels by means of program reviews, such as, weekly staff meetings (reference YVO Operating Instruction 800-5), monthly program management reviews (reference YVO Operating Instruction 800-4) and System Program Director reviews (reference YVO Operating Instruction 800-12) as well as, quarterly Command Assessment Reviews (reference YVO Operating Instruction 800-13) and HQ (AFSC) Program Status Reviews (reference YVO Operating Instruction 800-14).

Documentation to support program performance assessment will be maintained by the CSOC Integration Support Contractor in the Technical Data Center.

The Configuration and Information Management Directorate operates the Management/Technical Support System (MTSS) in support of all Space Launch and Control Systems Deputate activities. The CSOC program will have access to the MTSS for Configuration Information, Weekly Calendar, Schedule Activity Network, and the Technical Interchange Center which provides a document exchange repository and control mechanism for selected documentation as well as a central reference, acquisition, research, and document dissemination facility for Space Transportation System related documents throughout DOD.

3.2 SCHEDULES

A master program schedule indicating the key milestones for the segments is shown in Figure 3-1. Figures 3-2 through 3-5 are detailed schedules for the major segments. Responsibility for monitoring adherence to these schedules rests with the Cost Center Managers. The master program schedule will be maintained by the Program Control Office.

Schedule control will be accomplished from schedule information inputs received both from contractors and appropriate directorates. Schedule change control is necessary to insure traceability and program continuity. The specific office for control will depend on the level of activity of the event.

The Level I schedule identifies Headquarters USAF PMD and AFSC Form 56 commitments, NASA major program milestones, and mission model constraints which levy requirements upon the CSOC program. Responsibility for Level I schedules rests with the Program Control Office.

Level II identifies CSOC Program Office activities at the master program schedule detail. The Level II schedule will denote top level segment activities identified by the CSOC Program Office to implement requirements of the Level I schedule. Responsibility for Level II reporting rests with the Program Control Office; responsibility for monitoring adherence to the Level II schedules rests with the Cost Center Managers.

Level III identifies all activities required to accomplish the master program schedule. Each Cost Center Manager will have a Level III schedule for which he is responsible. The Level III schedules will include the minimum number of events in a segment that must occur in order to achieve program objectives and/or to show schedule progress. Milestones will include higher level controlling events, contract commitments, key technical and development events, hardware/software, deliveries and need dates from outside agencies, and IOC/FOC dates.

The Test schedule is shown in Figure 3-6. This schedule is excerpted from the TEMP and is generated and maintained by the Test and Evaluation Working Group (ref YVO OI 800-15).

The Training schedule is shown in Figure 3-7. This schedule will be included in greater detail in the Shuttle and Satellite Operations Transition Plans whose OPR is SD/YOO. Responsibility for the Training activities lies with the Training Planing Team (ref YVO OI 800-16). An activation schedule will be developed by SD/YOO.

All schedules will be managed IAW YVO OI 800-17.

3.3 INTERRELATIONSHIPS

The CSOC PMD identifies participating commands which "will, within existing resources, provide planning assistance and support" to the CSOC program. Where necessary, Memoranda of Understanding will be generated to clarify mutual responsibilities.

Because of the development approach which will involve exercising of options on the DSM program at the STC and will involve a joint venture with NASA JSC to assist in the definition of the shuttle operations at CSOC, project offices have been colocated at both locations.

The SOPC project office will provide the link with NASA JSC; the SOC project office will provide a similar link with the STC.

A close link with the user community will be maintained by the day-to-day relationship with the Deputy Commander for Space Operations (DCSO) SD/YO, which is responsible for the Manned Space Flight Support Group at JSC and the Air Force Satellite Control Facility (AFSCF), as well as the payload activities. The AFSCF/CVX has been responsible for activation of CSOC. Space Command has been designated as the Operating Agency for CSOC. The Program Office will continue activities as directed by the PMD until details of Space Command implementation are promulgated.

Additional user liaison will be enhanced by the proximity of the GPS and DMSP program offices at Space Division.

Air Force Systems Command (AFSC)/Space Division has been designated the Implementing Command. The Space Division has been assigned to manage the program. The CSOC System Program Director (SD/YVG) was appointed to provide centralized management for the research, development, acquisition, installation, test, and evaluation of the CSOC.

Space Command is designated as the operator of CSOC and will work with AFSC throughout the acquisition process, providing AFSC the operational planning for CSOC. A close operational linkage will exist between the Space Command Space Defense Operations Center (SPADOC) and CSOC for satellite attack warning similar to today's operational tie between SPADOC and the AFSCF.

Air Force Electronic Security Command (AFESC) as participating command will:

a. Provide COMSEC support in accordance with AFR 100-45.

b. Assist the program office in CSOC Statement of Work preparation.

c. Provide COMSEC and TEMPEST engineering support to the program office.

d. Provide COMSEC material and equipment based on requirements provided by AFSC.

e. Through the Air Force Cryptologic Service Center, provide COMSEC logistics support.

f. Assist AFSC and AFTEC in COMSEC related DT&E and OT&E.

Aerospace Defense Command (ADC) and Strategic Air Command (SAC) will:

a. Interface with and provide documentation and staff assistance to AFSC in the development of the CSOC System Operational Concept, associated operational plans and Memoranda of Agreement.

b. Make recommendations to AFSC and AFTEC on CSOC test requirements.

c. Interface with and provide staff assistance to AFSC in preparation of CSOC manpower requirements and training plans.

d. Coordinate with AFSC and AFLC in the definition of SPADOC/CSOC interfaces, including feasibility of joint use of support personnel and resources.

e. Interface with AFSC in the determination of host base support requirements for CSOC.

Air Force Logistics Command (AFLC) will:

a. Assist AFSC in the development and implementation of integrated logistics support planning for the CSOC.

b. Appoint a Deputy Program Manager for Logistics to serve as the ILS Director on the Program Manager's staff.

c. Support AFSC and AFTEC in planning and conducting tests as documented in the TEMP and in the AFTEC Test Program Outline.

d. Assist AFSC in developing a recommendation regarding the degree of contractor versus organic logistic support for CSOC.

e. Assist AFSC, ADC, SAC and AFCC in defining support requirements.

Air Force Test and Evaluation Center (AFTEC), as the OT&E agency, will:

a. Appoint a CSOC OT&E test director/test manager.

b. Manage the OT&E portions of the CSOC testing, with operating command and participating command resource support.

c. Provide assessments and reports for the appropriate milestones to HQ USAF in accordance with AFR 80-14.

d. Prepare the OT&E portions of the TEMP with participating command assistance.

e. Identify projected OT&E cost elements and budgetary requirements to the Program Office no later than 30 Sep 82 to support an FY 85 POM submission. Update as required.

Air Training Command (ATC) will assist implementing, participating, and supporting commands in:

a. Defining training concepts.

b. Identifying training requirements.

c. Planning to satisfy identified requirements on a timely basis through a cost-effective mix of contract, resident, and non-resident training programs through application of the Instructional System Development (ISD) process (reference AFRs 50-8, 50-9, 50-11, and 50-18, and 50-23).

d. Assessing costs and risks associated with training program alternatives.

e. Preparing training portions of the PMP and Integrated Logistics Support Plan.

f. Determining milestone schedules for development of planned training capabilities.

Air Force Communications Command (AFCC) will:

a. Assist the CSOC SPO in defining communications requirements and architecture; accomplishing source selection and evaluation activities relative to the communications segment contractor; and overseeing the services of the contractor. AFCC will also provide assistance to the SPO and AFTEC in planning and conducting OT&E. AFCC will assist the SPO in the programming of operations and maintenance resources required for eventual support of CSOC communications facilities; subsequently AFCC will operate and maintain CSOC communications facilities, as specified in Section 6. AFCC will assist AFLC in developing the communications portion of the Integrated Logistics Support Plan; assist AFSC and ADC in coordinating the definition of CSOC-SPADOC interfaces; and assist AFSC and SAC in coordinating the definition of CSOC-NAVSTAR GPS (Master Control Station) communications support requirements.

b. Assist AFSC in writing the C3 and frequency management portion of the PMP.

c. Fulfill remaining responsibilities as specified in the PMP.

Military Airlift Command (MAC) will assist AFSC in determining weather support requirements and provide operational weather support.

ADC, SAC, AFCC, and Air Force Technical Applications Center (AFTAC) will provide their satellite support requirements to AFSC in sufficient time for accommodation in the budgeting process.

NASA is the development agency for the space shuttle. The NASA will provide generic flight-crew training and will provide the major inputs for definition of the SOPC portion of CSOC. Interoperability between JSC and CSOC is a key requirement. Replication of NASA software will be a major factor in controlling LCC; functional replication of hardware will be a complementary cost control approach. Joint change control boards will be organized to maintain interoperability between the two centers. Software change documentation will be provided by NASA.

NASA will develop, implement, and maintain the JSC Controlled Mode for an initial, interim period to support early DOD space shuttle missions.

Details for maintaining JSC Controlled Mode in a stand-by mode to maintain interoperability beyond the 1990s are being studied as part of the NASA-AF joint definition study.

The NASA-AF joint definition study is a fifteen month effort beginning in January 1982 for the purpose of applying the expertise resident at NASA JSC to define a shuttle operations and planning complex (SOPC) at CSOC that will possess the best features of the existing JSC system, be modernized to take advantage of state of the art technology, and minimize the manpower intensive nature of the present system. It is intended that this design effort will produce system level specifications upon which the RFP for the SOPC will be based. Procurement by Space Division will be supported by NASA in the drafting of the RFP and in the evaluations during source selection. Technical administrative support of the SOPC development contract is planned, as well as field interaction, check out, and test of the SOPC.

3.4 REPORTING REQUIREMENTS

Reporting requirements to higher headquarters are satisfied by quarterly Command Assessment Reviews to HQ (AFSC) and Semi-annual Program Status Reviews (PSR) to HQ (USAF). These contain end item descriptions, schedules, and a summary of current status for the projects, including fund

obligations rates, and schedule or cost overruns which may have occurred within the CSOC program. The PSR will be prepared as of the last day of Jun and Dec. Copies of the PSR will be sent to participating and supporting commands and agencies within 15 days of closeout. CSOC is not a major program requiring DSARC or SAR presentations.

3.5 FINANCIAL MANAGEMENT

The Program Control Office provides the CSOC System Program Director with financial management of the CSOC program. This includes budget formulation, budget execution, and cost analysis.

The primary planning tool which provides for the integration of all related financial activities is the CSOC Program Breakdown Structure (PBS) and Dictionary. The PBS is a product and function oriented family tree composed of hardware, software, services and functional tasks which identify projec engineering efforts necessary to field the CSOC program. The Dictionary provides a statement of tasks associated with each PBS element. It provides the conceptual structure and the baseline for expansion required to identify and index individual contract work breakdown structure (CWBS) elements. It establishes project summary level coding assignments based on a tailored application of the guidance contained in MIL-STD-881A and AFSCM 173-4.

The PBS provides a means of uniform communication between all activities involved in the program management process. In particular the following products are related to the PBS via individual CWBS: (a) budgets, (b) cost performance reports, (c) schedules, (d) cost impact studies (estimates and forecasts), and (e) life cycle cost/design to cost analysis.

Each contractual effort will have a management team assigned to it consisting of a technical manager and a business manager. The business manager who will be assigned to the Program Control Office will be responsible for the contractual financial management using the PBS and Dictionary, appropriately tailored.

For effective control of the program funding an internal documentation system (Cost Change Action Request - CCAR) is employed which requires documentation and approval before requests for proposals are issued. CCARs require the approval of the CSOC System Program Director before any contractual arrangement or activity is begun which consumes financial resources (reference YVO Operating Instruction 800-18).

Cost/Schedule Control Systems Criteria (C/SCSC) provide standards that the contractor's internal system must meet for generating contract cost and schedule data. Discipline of the contractor's control system is provided through implementation of C/SCSC as prescribed by DODI 7000-2. The responsibility for cost analysis will be a task for the business manager on a particular contract.

Budgets have been established to provide the funding to conduct the management responsibilities of the CSOC program. Figure 3-8 shows the FY 83 Presidents' Budget (FYDP) for the CSOC program.

3.6 PROCUREMENT

The general procurement concept will be to encourage a competitive environment. Procurements will avoid state of the art developments unless they have been demonstrated to be viable concepts. Off-the-shelf procurements will be encouraged to minimize risks. Determination and Findings authority to negotiate without formal advertising pursuant to the authority of 10 U.S.C. 2304(a) exceptions (10) and (11) will be requested. Supporting Acquisition Plans will be generated individually for the major procurements as required.

For low risk efforts fixed price contracts will be sought with cost plus type contracts preferred otherwise. Exceptional contractor performance will be compensated by award fees if hard-to-define factors affect performance and by incentive fee if critical performance factors are quantifiable.

3.6.1 CURRENT CONTRACT SUPPORT

TRW Defense System Support Group is under contract as the CSOC Integration Support Contractor. The primary objective of this Cost Plus Award Fee contract is to integrate segments developed by other contractors or agencies into a cohesive system. The scope of this effort is exceptionally broad encompassing all the system engineering, support management, activation, and system level test functions required to implement CSOC within critical cost and schedule constraints. As part of the contract's system management, TRW will design, develop, activate and operate a Technical Data Center which will be a central repository for all CSOC system documentation and information associated with both the hardware and computer software of the system. The life of the contract is five years beginning June 1982.

3.6.2 MILITARY CONSTRUCTION PROGRAM (MCP)

The CSOC facilities contract will be managed by the Army Corps of Engineers. Funding for this contract will be a two year appropriation; however, it is intended that a single contract will be issued for both phases. The facilities program is discussed in greater detail in Section 8 of this PMP.

3.6.3 CURRENT ACQUISITIONS

The Communications Contract will provide external and internal communication capabilities for both the Shuttle and Satellite Control missions of CSOC. Because of the similarities in communication requirements for both missions, a common and integrated communications system is planned. GPS and other special user requirements will also be included. The integrated approach will minimize acquisition and operational costs and will result in a functional replication of existing Satellite Test Center (STC) and National Aeronautics and Space Administration (NASA) space tracking and control communications capabilities. This acquisition will be further described in two parts: Research and Development, and Hardware and Support Services.

3.6.3.1 RESEARCH AND DEVELOPMENT

The Communications acquisition will require system engineering, design development and integration of off-the-shelf, on-site external and internal communication capabilities for both the Shuttle and Satellite Control missions of the Consolidated Space Operation Center, using appropriation 3600 funds. The authority of 10 U.S.C. 2304(a)(11) is appropriate for this portion of the acquisition.

3.6.3.2 HARDWARE AND SUPPORT SERVICES

The Communications hardware and support equipment consists of primarily off-the-shelf state-of-the-art hardware, installation configuration and data management, integrated logistics support, spares, and sustaining engineering. Functional capabilities will include satellite terminal interfaces, wideband data transmission, narrowband data and voice transmission, switching and routing, technical control, Air/Ground (A/G) radio capability, recording/reproducing, intrusion detection and automated entry control, power regulation, timing generation, and weather terminal interfaces.

Acquisition of hardware and support services described above will be accomplished by a prime contractor following a competitive source selection. The winning contractor will be able to obtain the great majority of the

equipment from a number of commercial vendors' existing product lines. Appropriation 3080 funds will be used for this portion of the acquisition. The authority of 10 U.S.C. 2304(a)(10) is appropriate.

Provisioning procedures will be utilized in acquiring spares and some hardware.

A Fixed Price Incentive Firm (FPIF) target type of contract with an 80/20 cost share ratio and 125 percent ceiling is planned for this effort.

3.6.4 PROJECTED ACQUISITIONS

The SOC segment will be procured as options to the DSM contract. The options must be exercised prior to October 1983.

The SOPC segment will be a competitive procurement following the joint NASA-AF definition study which ends in March 1983. The determination of an acquisition strategy has not been made; however, the aforementioned general procurement concept will be followed.

Enginering analysis and trade studies to determine the appropriate Shuttle simulator systems to support requirements for Shuttle operations and Payload Specialist training are being conducted as part of the NASA-AF definition study. A CSOC simulator system as determined by this analysis and directed by HQ (USAF) will be acquired. Acquisition strategy for this procurement will be planned following the conclusion of the joint NASA-AF study. At that time, a decision will be made whether to procure the simulator system as part of the SOPC procurement or whether to procure it as a separate acquisition.

Training studies are underway, managed by the Directorate of Operations Support and Integration (SD/YOO), and assisted by the Air Training Command (ATC) to establish the training requirements. A Training Planning plan will describe the organizations and positions which will be implemented at the SOC in order to satisfy the operational concepts. This will include the staffing, training, and transfer of portions of these organizations as a phased build-up in capability.

The plan will be based on the following assumptions:

(1) A high military/civilian ratio in the CSOC staff.

(2) Modern, efficient training techniques will be used, including computerized simulation of the Air Force Satellite Control Network (AFSCN) range and specific satellite vehicles.

(3) Approximately twenty experienced STC-MCC personnel per SOC-MCC are available for providing the bulk of the training and acting as advisor to the new SOC-MCC personnel.

The following summarizes some of the more significant findings of a recent Transition Plan study:

(1) With respect to staffing, the study indicates that personnel must be requisitioned at least nine to twelve months prior to their SOC report dates, and that current staffing estimates may be larger than the validated requirement. A follow-on study will look at alternatives to resolve this discrepancy.

(2) With respect to training, the nominal training period for MCC personnel new to the AFSCN is twelve months, with training expected to occur at or near the SOC. For SOC-RCC personnel, the training period is fourteen months. The training period for the first complement of communications personnel is six months. All training includes course work and on the job training.

(3) With respect to operations, the nominal time to transfer support of a satellite program from a STC-MCC to a SOC-MCC is two months. The SOC-RCC will incrementally achieve operational capability over a period of eleven months. The communications area at SOC will incrementally achieve operational status over a period of twenty months. In the case of the RCC and communication, this is an activation process rather than a transfer. If the aforementioned transfer and training intervals of the study are assumed, the following general points of interest evolve.

(1) 1QFY 84: Start issuing personnel requisitions.

(2) 3QFY 86: First MCC operational.

(3) 1QFY 88: Four MCCs operational.

Training equipment procurement, installation and checkout must be available to support training early in CY 85. The scheduled Beneficial Occupany Data (BOD) of March 85 for the facility is marginally acceptable to support equipment deliveries. Any slips in MCP that affect the March 85 BOD will adversely impact the SOC IOC.

3.8.2 SHUTTLE OPERATIONS AND PLANNING COMPLEX (SOPC) TRANSITION PLAN

The SOPC transition approach will make maximum use of JSC experience and plans because:

(1) SOPC IOC will occur well after the Space Transportation System is a proven system. Therefore, SOPC methods and skill levels will reflect mature STS operations.

(2) Operations at SOPC will initially involve simple or repeat missions and will evolve to planning and operations for complex missions.

(3) The solution of non-routine SOPC planning and operations problems will be supported by NASA JSC.

The SOPC transition concept is primarily a formal training program conducted by the Air Force in the vicinity of the CSOC in conjunction with CSOC activation. An essential feature of this concept will be the development of an operations cadre trained at JSC. This cadre will eventually be used by the Air Force in the following ways to gain maximum benefit from their experience:

(1) Assist in the evolution of the SOPC training concept and development of training material.

(2) Serve as instructors to conduct some SOPC training courses.

(3) Serve in the operations group that transfers directly to SOPC to lead early SOPC operations.

(4) Support the DOD "controlled mode" activity at JSC as long as required.

Training of personnel for IOC staffing will be accomplished through formal courses, individualized on the job taining (OJT) and integrated team training.

Formal training courses will be designed to "piggyback" on the 20XX core curriculum being developed by the ATC for all Air Force personnel entering the Space Operations career field. Students who successfully complete the formal training program will be assigned to CSOC for job specific individual and integrated OJT. During this training phase, the proper flow of documentation and products are checked out, the idiosyncracies of the SOPC

hardware and software are learned, and teamwork is developed under integrated simulation conditions. This training phase will become the basis for evaluating the SOPC's progress toward operational readiness.

An initial study has been conducted to determine the phasing of personnel transition to support a SOPC IOC in late 1987. The results indicate that approximately 22 months are required prior to IOC to accomplish SOPC personnel training. Hence a SOPC facility must be available in the 1985 time period to support initial cadre assignments. Since training equipment procurements must precede instructor/cadre activity, even a scheduled Beneficial Occupancy Date (BOD) of March 1985 for the facility presents a "success oriented schedule" to support equipment deliveries. Any slips in the MCP that affect the March 1985 BOD will adversely impact the SOPC IOC.

3.9 RISK ANALYSIS

The approach for maintaining a continuous program of review and analysis to identify and evaluate program risks in the areas of technical performance, schedule, costs, operations, and their interrelationships will center on the program assessment tools discussed in Section 3.1 TECHNICAL PERFORMANCE ASSESSMENT.

In general risks will be minimized by designing a system which has been proven at JSC and STC, and by utilization of off-the-shelf hardware, to the maximum extent practical. Although the latest and most modern technology will be used where cost benefit trade studies recommend, no state of the art developments are required.

The major risk is budgetary caused by program delays initiated while the Satellite Control Capability Integration was accomplished. These have caused a delay in obtaining well-staffed independent cost estimates.

Several major efforts have been planned to increase confidence in the budget estimates and reduce this program risk. In the area of training, two contractor efforts are underway at JSC and STC to determine training requirements. The results of these activities will be integrated into a single training package to share rsources and reduce costs. Support to this effort will be provided by the CSOC Integration Support Contractor (CISC). Results will be incorporated into the FY 85 POM. O&M costs will be estimated by formation of a Task Force headed by the user community with expected participation by the Space Command. Heavy reliance will be placed upon historical records at JSC and STC. Again, the CISC will support this activity in order to provide results prior to the FY 85 POM Submission.

The largest programmed cost element of CSOC is SOPC. A joint NASA-AF SOPC Definition Task is being funded to address several critical cost driver areas (for example, data privacy, interoperability, simulator). This long-delayed NASA-AF effort will provide the best cost estimate available because of the NASA experience in shuttle operations. Plans are to have these data before the FY 85 POM period. This joint effort will also support the O&M cost uncertainties mentioned above by providing historical data.

Program office activities have been concentrated on defining the Network Control Segment (NCS) and elements of the facility design (TEMPEST, Electromagnetic Pulse hardening). Although uncertainties in these areas are not considered as great as in the earlier examples, program office awareness with cost control is bringing about a maximum emphasis in this critical cost area. The CISC will support these cost determinations. Results will be incorporated into the FY 85 POM Submission.

The last area of cost concern is the SOC. Although a great deal of cost control is inherent in the SOC acquisition approach which involves exercising of fixed-price options on the IBM DSM contract at the STC, certain definition uncertainties require investigation before firm cost estimates can be obtained. These are in the areas of interoperability, automatic range scheduling and control which is interwoven with the NCS definition, and the

communications switch design. In order to firm up these decisions, funds have been provided to conduct in-scope trade studies on the DSM contract. Results will be available in time to support the FY 85 POM submission.

In addition to these specific areas, the CISC is tasked to emphasize cost planning and control, and particularly to identify high risk cost items. Initial data will be provided by the CISC as part of the Design to Life Cycle Cost document scheduled in the Sep 82 period.

3.10 INFORMATION

As a general policy, release of information to the media will be cleared for presentation through SD/PA prior to release (reference YVO Operating Instructions 800-8).

Information responsibilities will include a coordination policy and determination of what is releasable. The coordination policy will apply to contractors and other agencies and will be consistent with current SD/YV policy. The determination of releasable information will relate to proprietary, financial, source selection sensitive, and FOR OFFICIAL USE ONLY (reference YVO Operating Instructions 800-9).

CSOC will become involved in classified areas that are covered by the Space Transportation System SCG and the individual payload and mission SCGs. A System Security Concept will be developed by July 1983 to define the security approach to be taken during the CSOC development. It is intended that this will contain sufficient information to obviate the need for a separate CSOC Security Guide which has been
Team is being established in accordance with AFR 50-8. This team will develop a Training Program Development Management Plan by Aug 82. The results will include a determination of the role to be played by ATC in implementing the CSOC training program, as well as provide the basis for training equipment and course development acquisitions. An acquisition strategy consistent with the foregoing will be formulated at that time.

A network control segment for scheduling and controlling operational resources will be partly procured as an option to the DSM contract and partly as a portion of the Communication contract.

Other lesser CSOC requirements and studies may require small scale procurement activity. In those cases where it is appropriate, the Program Office will attempt to make use of the Small Business Administration contractor assets.

3.7 CONTRACTOR DATA

Three elements of CSOC create an increased sense of criticality to contractor data. There are (1) the numerous operational, scheduling, and controlling interfaces, (2) the large amount of replicated software (interoperability), and (3) the "blue suit" operational concept.

3.7.1 INTERFACE CONTROL DOCUMENTS

The CSOC will interface with and be interoperable with the STC and JSC. It will require scheduling of the Tracking and Data Relay Satellite System (TDRSS) requiring communication interfaces with the White Sands Ground Terminal (WSGT) and the NASA Goddard Space Flight Center (GSFC). Connectivity to the eastern and western launch sites is required. On site interface with the mid-CONUS Remote Tracking Station and with the Defense System Communication Satellite (DSCS) and the commercial Domestic Satellites (DOMSAT) require close interface control. Lastly numerous other interfaces with other CSOC users will be required through leased lines and alternative circuits.

All interface control documents (ICDs) will be CDRLs on the appropriate contracts. Changes to these ICDs will be strictly controlled. Details are provided in Section 4 of this PMP.

3.7.2 SOFTWARE DOCUMENTATION

In order to minimize the costs associated with the development and maintenance of software, the CSOC is being developed employing maximum replication of over six million lines of code resident in the JSC system. Inherent in the exercising of options on the DSM contract will be the exact replication of the STC software. The benefit to the CSOC program is enormous, for not only is the development cost of this software eliminated, but also the modifications and maintenance costs become significantly smaller.

The price that is paid for this savings is the burden of criticality this imposes on the software documentation. All software documentation will be CDRLs which will be made available to the interoperating parties. A Technical Data Center will be activated and operated by the CSOC Integration Support Contractor for the primary purpose of being a repository for these CDRLs as well as for changes to the software. Contractual agreements will be established guaranteeing delivery of these changes. The mechanism for controlling computer software changes is detailed in Section 4 of this PMP.

3.7.3 TRAINING MANUALS

The specific application of organic versus contractor support for CSOC, as well as skill level (AFSC) requirements, will be determined by logistics analysis processes and will be reflected in the Training Program Development Management Plan. The large percentage of "blue suit" personnel makes the requirement for training manuals significant. Training manuals will either be provided as a CDRL on ATC managed TYPE I training contracts, on HQ (AFSC) managed system specific training, or as in the case of technical manuals be provided as commercial maintenance manuals.

The concept of data management will involve close control of ICDs and Engineering Charge Proposals (ECPs) using the Configuration Control Board process outlined in Section 4 and the storing and updating of software, ICDs, drawings, manuals, etc. by the CSOC Integration Support Contractor in the Technical Data Center.

3.8 TRANSITION PLAN

A transition plan will be developed for the transfer of the DOD Shuttle mission operations from NASA JSC to the CSOC including transfer of people from the Manned Space Flight Support Group (MSFSG) at JSC. In addition the transfer of selected satellite program operations from STC to CSOC including personnel will be developed. Both of these plans will be provided to HQ (USAF)/RDSL in preliminary form by Sep 82 and in final form by Nov 82.

3.8.1 SATELLITE OPERATIONS COMPLEX TRANSITION PLAN

This Transition Plan will address the transfer of selected satellite program operations from the STC to the CSOC. As a management tool it will describe parameters for the acquisition of personnel, training, and program transfer. The scope of the plan will discuss the direct operations related technical activities at the SOC including generic Mission Control Complexes (MCCs), the Range Control Complex (RCC), the System Development and Test Laboratory (SDTL), Computer Operations, and the Communications Complex (COMM). The plan is expected to evolve in response to changing conditions. It will require mission-specific tailoring once the occupant satellite programs are identified. The schedule for the availability of SOC data systems controls the potential start times for activities at the SOC. The requested in the PMD for Sep 82. Also a preliminary System Security Standard will be developed by Sep 82 in accordance with AFR 207-1 that describes operational site security requirements. It shall consider CSOC a Priority A resource and be written in accordance with AFR 207-1 and AFM 207-21. A physical security program will be established and maintained.

CONSOLIDATED SPACE OPERATIONS CENTER MILESTONES

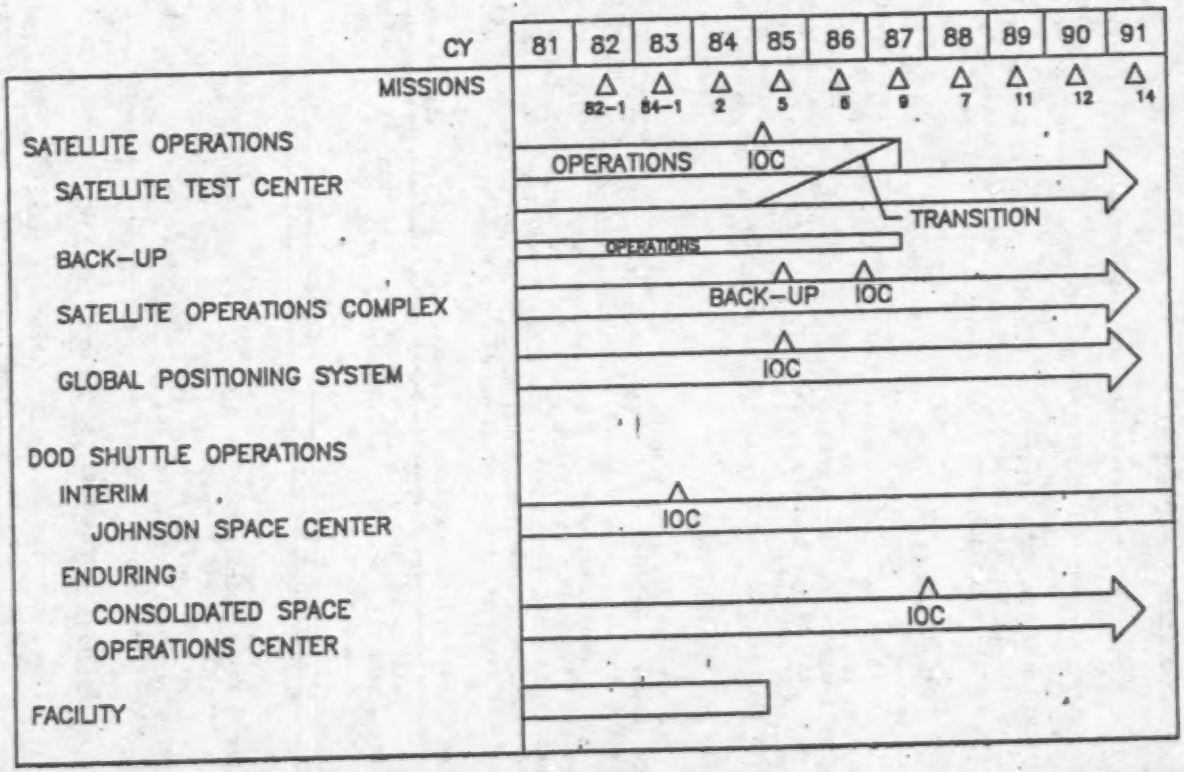

FIGURE 3-1 MASTER PROGRAM SCHEDULE

SATELLITE OPERATIONS COMPLEX
ACQUISITION MILESTONES

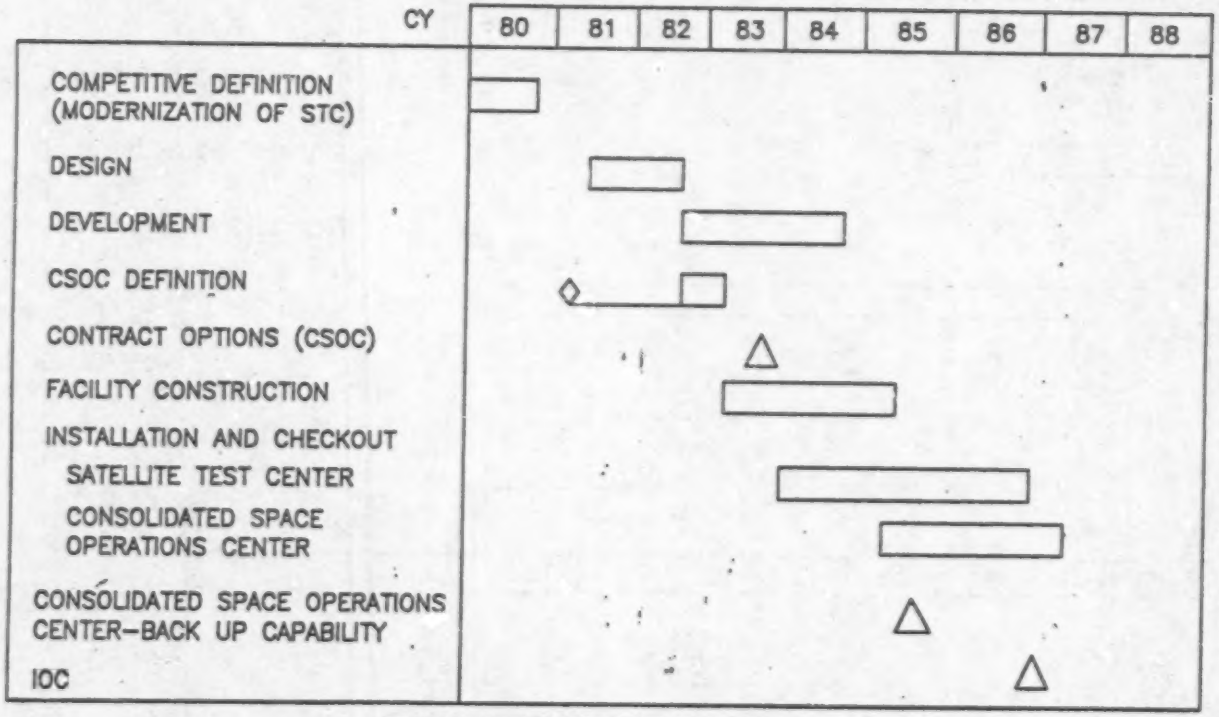

FIGURE 3-2 SOC ACQUISITION MILESTONES

SHUTTLE OPERATIONS AND PLANNING COMPLEX ACQUISITION MILESTONES

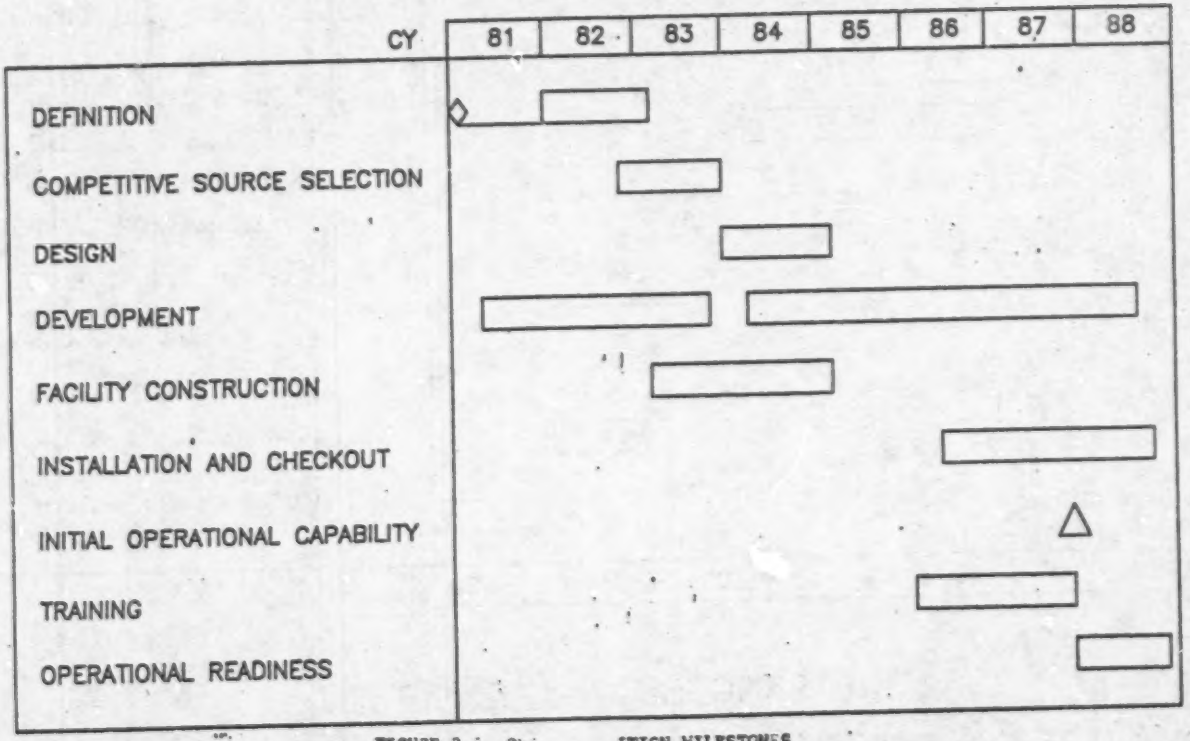

FIGURE 2. [illegible] ITION MILESTONES

CSOC COMMUNICATION ACQUISITION MILESTONES

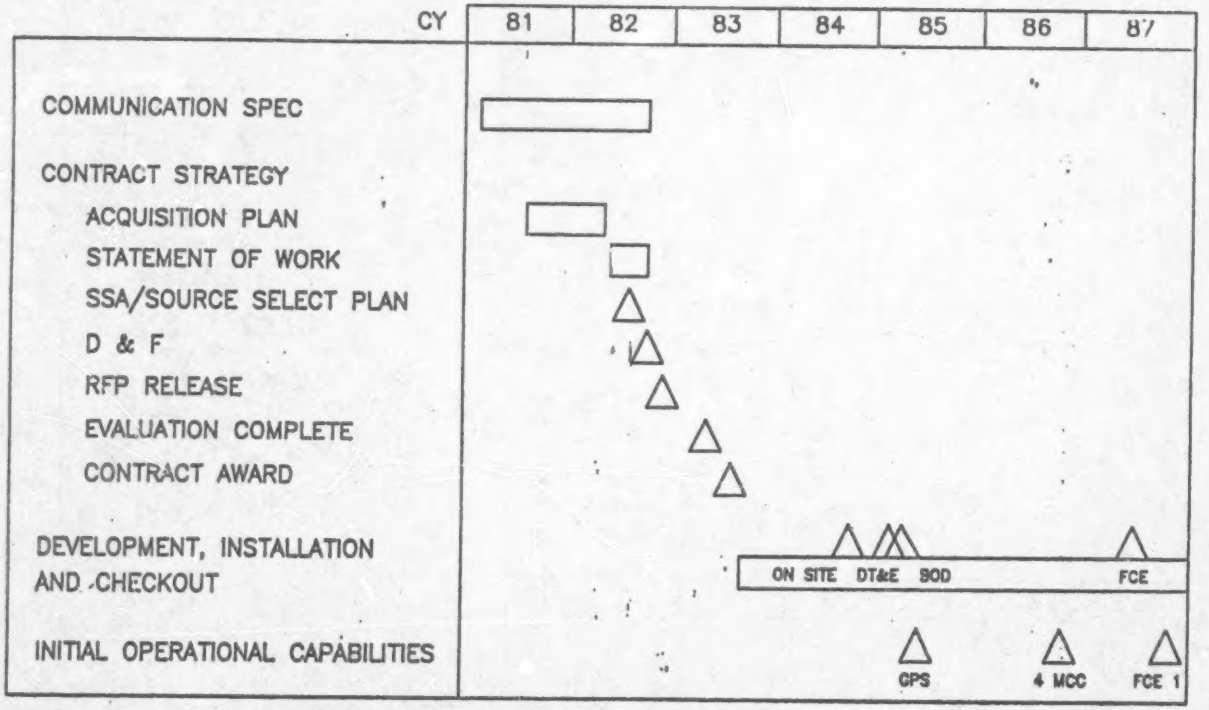

FIGURE 3-4 COMMUNICATION ACQUISITION MILESTONES

CSOC FACILITY ACQUISITION MILESTONES

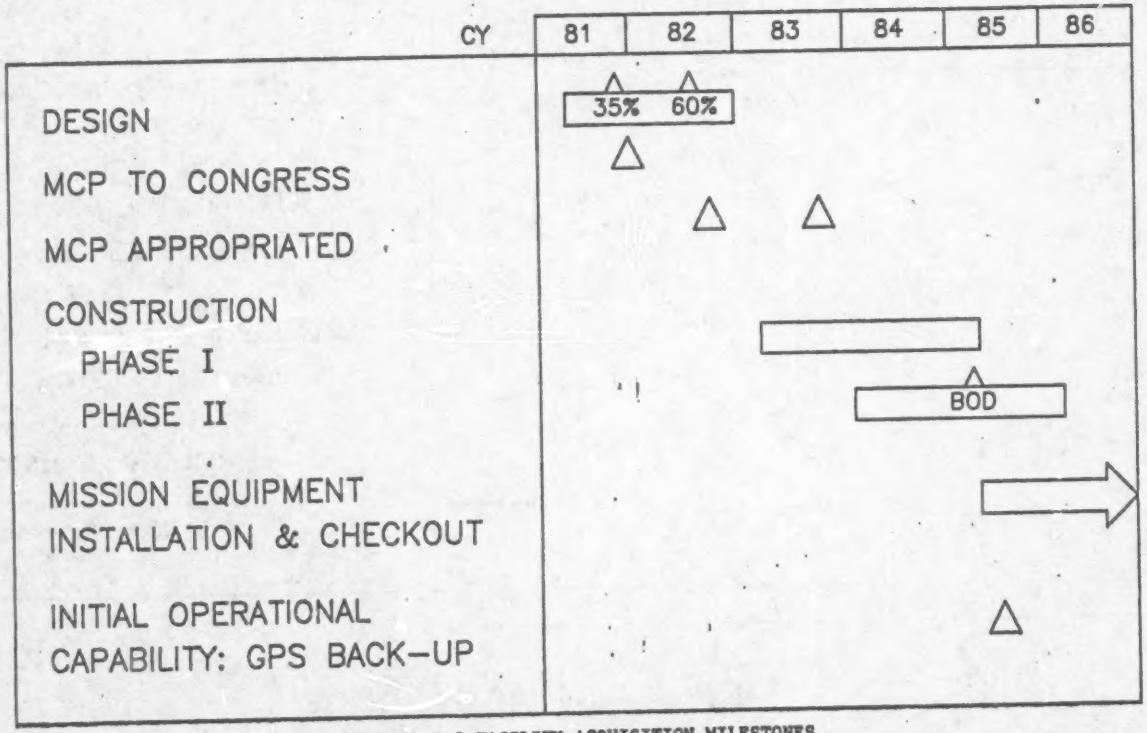

FIGURE 3-5 FACILITY ACQUISITION MILESTONES

CONSOLIDATED SPACE OPERATIONS CENTER
TESTING MILESTONES

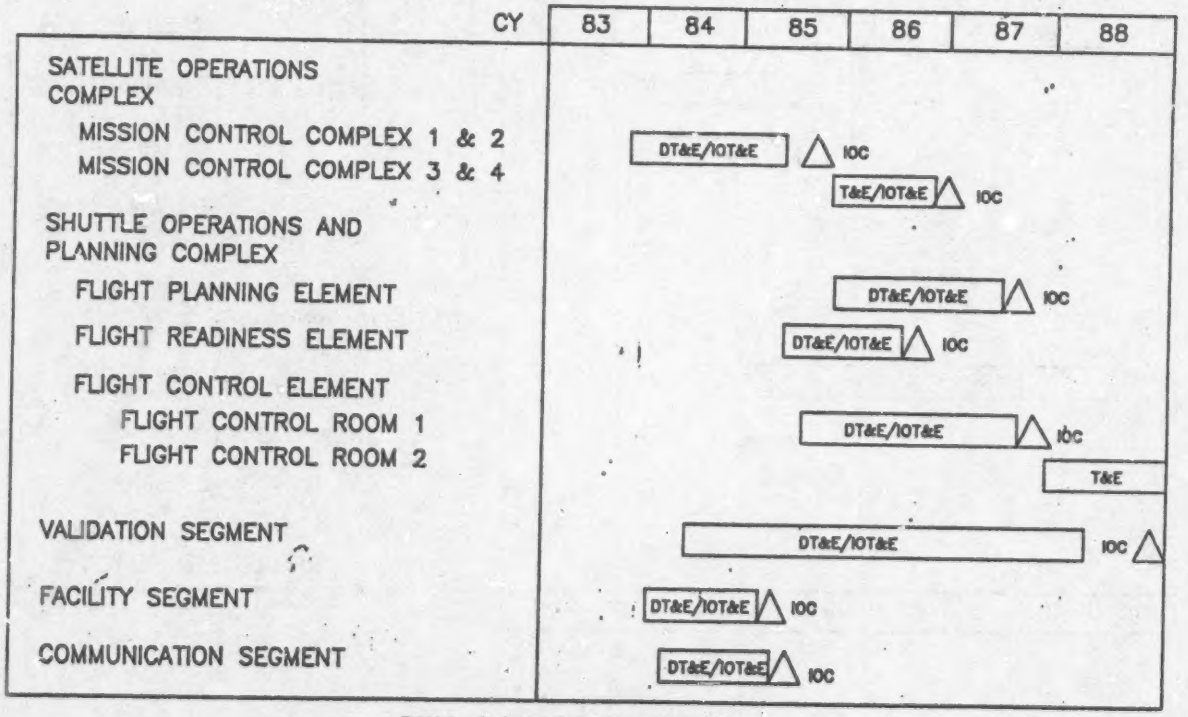

FIGURE 3-6 CSOC TEST MILESTONES

CONSOLIDATED SPACE OPERATIONS CENTER
TRAINING

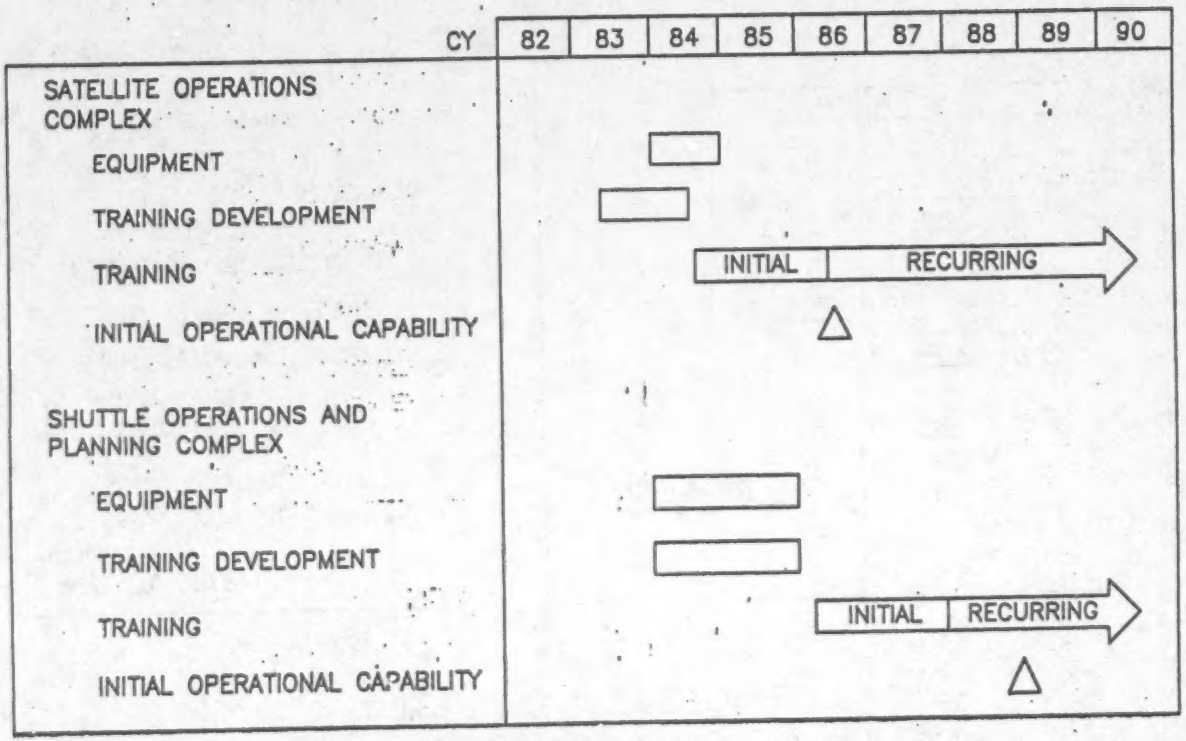

FIGURE 3-7 TRAINING MILESTONES

WEAPON SYSTEM BUDGET ESTIMATE (AMOUNT IN MILLIONS OF DOLLARS)	2. WEAPON SYSTEM	3. CONTRACTOR	REPORTS CONTROL SYMBOL
1. CATEGORY: CSOC FY 83 PRESIDENT'S BUDGET	4. EQUIPMENT [ ] CONTRACTOR FURNISHED [ ] GOVT FURNISHED AERONAUTICAL	5. PRODUCTION PLANNING SCHEDULE	6. AS OF DATE: 14 May 82 7. PREPARED BY

DESCRIPTION A	MFC B	PRIOR YRS C	FY 82 D	FY 83 E	FY 84 F	FY 85 G	FY 86 H	FY 87 I	FY 88 J	FY 89 K	FY 90 L	TOTAL M
3600		3.8	18.4	32.1	59.3	64.4	45.3	35.8	95.3	30.8	22.4	407.6
3080				20.7	83.2	167.6	152.4	114.4	98.2			636.5
3300				67.7	78.0							145.7
TOTAL		3.8	18.4	120.5	220.5	232.0	197.4	150.2	193.5	30.8	22.4	1189.8
3400					9.4	27.0	93.1	112.8	166.2	233.0	243.4	884.9

AF FORM 1537 REPLACES AF FORM 749, FEB 64 WHICH IS OBSOLETE. FIGURE 3-8 FY 83 PRESIDENT'S BUDGET FOR CSOC

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4.0 SYSTEM ENGINEERING AND CONFIGURATION MANAGEMENT

4.1 SYSTEM ENGINEERING MANAGEMENT

4.1.1 OVERVIEW

During the initial program phases, continued definition of operational and system requirements will be made and then translated and expanded into level A design requirements, specifications, criteria, test plans, and test procedures. System analyses and tradeoff studies will be made to determine the required functional and physical integration of the control segments and their supporting elements.

4.1.1.1 TECHNICAL SUPPORT

The CSOC System Program Office (SPO), SD/YVO, is responsible for the total acquisition program. Various elements of Space Division will have major technical support roles during the acquisition phase. The AF Space Command will have the eventual operating responsibility. AFSCF and MSFSG will provide a nucleus of trained individuals and procedures for Operations and Maintenance (O&M). The major roles of participating USAF commands, NASA, and other DOD organizations are described in Section 3, Program Management. In addition, the following technical support roles have been identified.

4.1.1.1.1 AEROSPACE CORPORATION

The Aerospace Corporation will provide General Systems Engineering and Integration (GSE&I) under direction of the CSOC SPO.

4.1.1.1.2 INTEGRATION CONTRACTOR

Because several associate contractors will provide the major portions of CSOC, the services of an integration contractor are required. The Air Force has selected TRW Corporation as the CSOC Integration Support Contractor (CISC). The CISC will provide support for systems engineering, integration activation, and system-level testing. This will include technical appraisals and analyses, identification and resolution of problems, and the review of design and test data.

4.1.1.1.3 ASSOCIATE CONTRACTORS

Associate contractors will supply the SOC segment, the SOPC segment and the remaining operational segments. The Facilities Segment (FS) will be acquired by the Army Corps of Engineers under the Military Construction Program (MCP). Associate contractors will be managed directly by the System Program Office except for the FS . As Space Command assumes CSOC operations in the late 1980's, operations and maintenance contracts will be required.

4.1.2 SYSTEM DEFINITION

The SPO will provide the high-level system definition including level A specifications for CSOC and its seven segments using resources of The Aerospace Corporation. NASA/JSC has been assigned to define the SOPC segment and the Shuttle simulator through the SOPC Project Office in Houston, Texas. The SOC segment has been largely defined and and will be acquired under options in the AFSCF Data System Modernization (DSM) Contract. Drafts of the CSOC System specification and several system segment specifications have been prepared. The associate contractors will generate the lower tier specifications for each segment. The Facilities Segment general requirements have been integrated and validated by the SPO, based on a facilities Development Specification generated in 1980. An architectural and engineering contract for facilities design has been awarded to the firm Holmes and Narver. This effort will provide detailed facilities definition to allow the Army Corps of Engineers to contract for construction . Further details on the Facilities Segment are provided in Section 8.

4.1.2.1 SHUTTLE OPERATIONS AND PLANNING COMPLEX (SOPC) SEGMENT DEFINITION

The SOPC is divided into three functional areas: Flight Planning Element (FPE), Flight Readiness Element (FRE), and Flight Control Element (FCE). The SPO controls the definition of the SOPC segment through the SOPC project office in Houston TX using NASA resources. The SPO will acquire SOPC with NASA support. The level A requirements for SOPC are coverd in specification SS-CSOC-00003.

4.1.2.1.2 FLIGHT READINESS ELEMENT

The major flight readiness function is the preparation and verification of on-board Shuttle software.The Data Load Preparation System (DLPS) is used to generate, validate, certify, and control the On-Board Digital Data Loads (ODDL) for the spaceborne data processing computers on Shuttle flights. The DLPS is a scaled-down version of the NASA Software Production Facility (SPF), consisting of a large-scale host computer coupled to two or more Shuttle avionics computers.

4.1.2.1.3 FLIGHT PLANNING ELEMENT

The SOPC Flight Planning Element is a replica of the NASA configuration. The SOPC capabilities include an interactive, long range planning system (System X), an operational flight design system (System Y), and a crew activity planning system (CAPS).

The SOPC System X is a duplicate of the NASA system, utilizing a minicomputer, interactive graphic terminals, a data base terminal, and a word processor.

The SOPC System Y consists of detailed flight design software executing on a host computer compatible with NASA's. The SOPC CAPS is a duplication of the NASA system, featuring a minicomputer, interactive terminals, and word processor. The flight planning software will be transferred directly from NASA. The Flight Planning Element definition essentially exists in the NASA systems documentation.

4.1.2.2 SATELLITE OPERATIONS COMPLEX (SOC) SEGMENT DEFINITION

The SOC consists of four Mission Control Complexes and a System Development and Test Laboratory. The SOC elements, have largely been defined through the DSM program at STC. The DSM contractor has been assigned tasks to make recommendations on interoperability. Some deviations from the DSM configuration will occur in switching and routing. The Range Control Complex will be assigned to the CSOC Network Control Segment for integration with Shuttle resource control. Options exist in the DSM contract to replicate portions of the DSM configuration at CSOC. Configuration Control will be used to maintain SOC/STC integrity and interoperability. The SOC segment level A specification, SSS-CSOC-00002, defines differences between the DSM Command and Control Segment and the SOC configuration.

4.1.2.2.1 MISSION CONTROL COMPLEXES (MCC)

A number of Mission Control Complexes (MCCs) are required to support many space-based missions. The two general functions, to be performed independently by each MCC, are satellite contact support and operational planning and evaluation. Each of these functions is supported by a dedicated data-processing system within each MCC. The planning and evaluation system is compatible with and provides backup for satellite contact support. The DSM-defined hardware and software will be replicated at CSOC.

4.1.2.2.2 SOFTWARE DEVELOPMENT CAPABILITY

The STC uses a System Development and Test Laboratory (SDTL) to perform two major functions - Satellite Contact Support and Mission Planning

and Evaluation functions. The development of most software for the SOC will be performed at the STC so full replication of the SDTL at CSOC may not be necessary. However, means of performing some ancillary functions of the SDTL, such as simulation, training and technical-data management, and possibly specialized software development require that the SDTL function be incorporated at CSOC.

4.1.2.3 COMMUNICATIONS SEGMENT DEFINITION

The Communications Segment (CS) consists of equipment for internal and external voice, data, and facsimile transmissions. External communications systems include operational and administrative voice nets, wideband and narrowband data links, and facsimile transmission between the CSOC and the remainder of the Space Operational Network. Internal communications includes administrative and secure phone systems, paging system, and intercoms. Internal and external communications for SOC- and SOPC-related requirements will be integrated into the single communications segment. The Communications Segment provides an opportunity to use modern technology for cost-effectiveness over the life cycle, without the sacrifice of compatibility and interoperability. The communications segment requirements are covered in the CS level A specification, SSS-CSOC-00004. The communications segment contractor will develop more detailed requirements, specifications, and ICDs.

4.1.2.4 SUPPORT SEGMENT DEFINITION

The support segment consists of common equipment and functions that support more than one other segment. Common items consist of a timing subsystem, a Weather Support Unit (WSU), an uniterruptable power subsystem (UPS), a security control subsystem, a Technical Data Center (TDC) and an Operations Command Center. The definition of the support segment will be made in the same manner as for the Communications Segment and covered in specification SSS-CSOC-00006. Acquisition of most of the support segment will be under the same Contract as the CS except for the TDC which will be acquired under the integration contract.

4.1.2.5 FACILITIES SEGMENT

The facilities segment is covered in Section 8, Civil Engineering.

4.1.2.6 VALIDATION SEGMENT DEFINITION

The VS comprises the CSOC Simulation System (CSS) and the Training Equipment System (TES). It provides for simulation of the Shuttle stations, payloads, Remote Manipulator and Networks and for training of flight and ground crews through the use of classrooms, trainers, simulators, and operational equipment. The definition of the VS is being done in part by NASA through the SOPC project office and in part by the SPO with support from the SOC project office, the CISC, and the Aerospace Corp. The level A requirements for the VS are covered in specification SSS-CSOC-00007.

4.1.2.7 NETWORK CONTROL SEGMENT DEFINITION.

The NCS comprises equipment and functions to schedule NASA and AFSCN resources and to control AFSCN and internal CSOC resources. The definition of the NCS is being made in the same manner as for the CS and the requirements are covered in level A specification SS-CSOC-00008. Acquisition will be mostly as an optin to the DSM contract.

4.1.3 ENGINEERING DESIGN APPROACH

Many of the physical and functional elements and interfaces of the CSOC comprise duplication or functional replication of existing equipment and software. Early engineering design includes communications interfaces,

technical compatibility of NASA equipment, simulator systems, and DSM-provided system elements.

4.1.4 BASELINE CONTROL AND MANAGEMENT

A baseline control and management system will be tailored to accommodate compatibility with large amounts of existing equipment, software, and procedures.

The requirements for technical reviews/audits, technical interchange direction meetings, and any independent reviews are being established in the CSOC acquisition planning. Maximum participation in joint configuration control boards by the participating and supporting agencies will be sought, e.g., NASA for SOPC, AFSCF for SOC. Both hardware and software will be under formal configuration control. This is discussed in more detail in Section 5 of this PMP.

4.1.5 STUDIES AND ANALYSES

The following studies and analyses are respresentative of those being conducted by the Integration Contractor:

a. System Design Trade Study

b. Cost Estimate Analysis

c. Reliability and Maintainability Allocations, Assessments, and Analysis.

d. Accident Risk Assessment

e. Logistics Support Analysis Plan

f. Design to Life Cycle Cost

g. Optimum Repair Level Analysis

h. Clandestine Vulnerability Analysis

i. Survivability Cost Effectiveness Trade-off Studies.

4.1.6 RISK REDUCTION

The CSOC development program will emphasize the minimization of changes to the available operational software as a major risk-reduction criterion. The software developed at JSC for Shuttle operations and at STC for satellite operations will be used as-is, wherever practical. Hardware will be duplicated where practical and functionally replicated where lower life-cycle costs are projected through the use of newer, compatible equipment. Off-the-shelf designs will be used in remaining areas, e.g., communications, rather than unproven, state-of-the-art equipment.

4.1.7 TECHNICAL REVIEW

The CISC is required to conduct quarterly technical and Contract-status reviews. These reviews will cover progress, problems, impacts, and corrective actions taken or recommended. Similar reviews will be required by the segment contractors. More frequent internal reviews will be held by the CSOC Program Office.

4.1.8 RELIABILITY, MAINTAINABILITY, AVAILABILITY (RMA)

RMA figures for Shuttle and Satellite Operations have been established and incorporated in the CSOC systems specification. Allocations have been made to the CSOC segments and are being incorporated into the

segment specifications. Further refinement of these allocations will be made using the RMA assessment and analysis by the CISC.

4.1.9 MATERIAL SELECTION

Material selection for resistance to corrosion, fungus and combustion will be based on requirements imposed on like or similar equipment at the STC and NASA JCS and on practices used in high quality off-the-shelf designs in order to avoid costly special designs.

4.1.10 VULNERABILITY AND SURVIVABILITY

The Vulnerability Analysis and Survivability Trade-off study by the CISC will be used to supplement previous threat and survivability studies for on-going reassessment of CSOC survivability.

4.1.11 TRANSPORTABILITY

Transportability aspects are covered in section 9 of this PMP.

4.1.12 COMPUTER RESOURCES

Requirements and plans for computer resources are contained in the CSOC Computer Resources Integrated Support Plan (CRISP) and Appendix D of the CSOC System Specification.

4.1.13 ELECTROMAGNETIC COMPATIBILITY

An integrated electromagnetic compatibility (EMC) program will be established to assure that the CSOC system will operate properly at the designated location without adverse effect upon the ambient environment or collocated equipment. EMC requirements will be applied IAW tailored MIL-E-6051D. EMC design guidance and design principles will be obtained from AFSC DH 1-4.

4.1.14 SAFETY

Safety and mishap-prevention standards and requirements will be an integral part of program management. Safety requirements will be applied IAW tailored MIL-STD-1574 and supplied in a System Safety Program Plan generated by the CISC.

4.1.15 ENVIRONMENTAL IMPACT

The CSOC Program Office has conducted an environmental impact assessment in accordance with the Program Management Directive. Environmental impact will be reassessed as required if major modifications occur. Reference guidelines will be extracted from AFR 19-2.

4.1.16 HUMAN ENGINEERING

Human engineering principles will be largely a replication of principles applied by the AFSCF DSM program and by NASA JSC and those incorporated in high-quality off-the-shelf designs. Newly developed equipments and software will be engineered to maximize effectivenes of human resources and to minimize manning, operator error, task complexity, and task time, especially where time-critical functions support personnel interaction.

4.1.17 PROGRAM RISK ANALYSIS

Program management will include a continuing analysis of risks associated with the attainment of cost, schedule, and performance objectives. This analysis will identify critical performance and management areas. It will lead to definition of needs for design verification analysis, critical

areas for testing and evaluation, and critical milestones. Contractors will be required to analyze the risks of attaining program objectives and requirements, and to promptly report significant problems to the CSOC SPO.

The CSOC development program will emphasize the minimization of changes to the available operational software as a major risk-reduction criterion. The software developed at JSC for shuttle operations and at STC for satellite operations will be used as is wherever practical. Hardware will be duplicated where practical and functionally duplicated where lower life-cycle costs are projected through the use of newer, compatible equipment. Off-the-shelf designs will be used in remaining areas, e.g, communications, rather than unproven, state-of-the-art equipment.

4.1.18 TECHNICAL PERFORMANCE MEASUREMENT

The Integrating Contractor will prepare and submit a System Engineering Management Plan (SEMP), as specified in MIL-STD-499A. The SEMP will specify the technical performance parameters selected as key indicators of program success and will serve as a guide for the CSOC segment contract SEMPs.

4.3 CONFIGURATION MANAGEMENT

The CSOC configuration management system will utilize AFR 65-3, MIL-STD-483, AFSCP 800-7 and the Configuration Management Plan, SD-CSOC-00021. Configuration Management will support the Preliminary Design Reviews/Critical Design Reviews (PDR/CDR) to assist the technical personnel in evaluating contractor designs for compatibility with program requirements. The SD/YVC Directorate is the SPO agent responsible for STS configuration management through the YVO Configuration Control Board (CCB).

A Memorandum of Understanding between SD and both NASA and Satellite Test Center (STC) is required for the reciprocal use of their configuration management program procedures in order to achieve maximum interoperability.

4.3.1 CONFIGURATION IDENTIFICATION

Configuration identification will be achieved by preparation of specifications, drawings and other documents that describe CSOC configuration items. Hardware and software documentation will be used to establish item baselines and changes thereto for updated configuration identification at any specific time. Configuration items (CIs) provided from Johnson Space Center (JSC) or STC procurements will use available configuration identification supplied with the initial acceptance and updates as required by design changes as incorporated. Use of existing JSC or STC documentation will minimize CSOC preparation and change control expenses.

4.3.2 INTERFACE CONTROL

Interface control will be exercised in accordance with MIL-STD-483 and SAMSO-STD-77-4. CSOC system interfaces will be described by reference to specifications and Interface Control Drawings (ICDs). An Interface Control Working Group will be formed to expedite coordination of (ICDs). Members will be cognizant technical or management personnel of agencies and contractors associated with the CSOC effort. Existing JSC and STS ICDs will be used to the maximum practical extent.

4.3.3 CONFIGURATION CHANGE CONTROL

Configuration change control begins with the establishment of baselines. All changes to established baselines must be approved by the SD CCB. The CSOC Configuration Management Plan will be used for change control processing. STC and JSC will retain configuration change control of their respective CIs with the CSOC program office

participation on those items used in the CSOC system. Deviations and Waivers for both agencies will be handled through comparable configuration management precedures contained in DOD-STD-480A.

4.3.4 CONFIGURATION STATUS ACCOUNTING

CSOC configuration status accounting for JSC or STC CIs will use the data output from each respective accounting system established under their cognizance. The status of SD supplied CIs for CSOC usage will be monitored in accordance with AFR 65-3 and implemented using the SD developed and AFSC approved Configuration Status Accounting System (D027) and the Change Proposal Accounting System (D027A). This system is currently employed on other contracts.

4.3.5 CONFIGURATION AUDITS

Configuration management audits will be controlled by the procuring agency for all hardware and software items. CSOC personnel will participate in JSC and STC audits to verify the implementation of requirements. CSOC procured items will be audited using MIL-STD-483 and MIL-STD-1521 as guidance.

4.3.6 ORGANIZATION

A Configuration Control Board (CCB) will be established and chaired by the Program Director or delegated representative. The CCB membership will include representatives of the Program Office, Configuration Management, Engineering and Test, Contract Management, Aerospace Corporation, AFSCF, and contractors. Coordination with control boards at STC and JSC will be presented in a later revision of this PMP.

4.3.7 UNIFORM SPECIFICATION PROGRAM

The top-level Specifications will be prepared by or under the direction and control of the CSOC Program Office. Lower tier specifications will be prepared by contractors as specified in Statements of Work. All specifications will conform to the requirements of MIL-STD-490 as tailored for CSOC. MIL-STD-483, Appendix VI, will also be applicable for software specifications.

4.3.8 CONFIGURATION MANAGEMENT PLAN

Each contractor will be required to establish clear responsibility within his organization for implementing the requirements of the configuration mangement program directed by the SPO. These responsibilities and procedures will be documented in the Configuration Management Plan monitored by the CISC and approved by the Director of Configuration and Information Management.

4.4 INFORMATION MANAGEMENT SYSTEM

The Information Management Division (SD/YVCI) has overall responsibility for the application of all segments of the Information Management System (IMS) for YV programs. The IMS will provide on-line retrieval of data from several data bases to insure that both technical and administrative management perceptibility of activities is current. Management of the IMS development is jointly shared by HQ SD/YVC and NASA. This effort warrants the compatibility of the IMS by combining functions and sharing existing capabilities of both organizations, thereby minimizing the total number of different computer systems needed to support information programs.

An office of primary responsibility (OPR) will be assigned by each division to insure the integrity of the information concerning their specific activity. A system OPR will be assigned by YVC to act as the interface between system operations and the user's of the information. The system OPR will manage the Automated Management Information Center (AMIC) which will be a

centralized location established for the supporting equipment needed for the IMS operation. The system OPR will insure terminal access for system users compatible with the user's response requirements. The responsibility for planning and overseeing the requirements for information needed to successfully accomplish a discipline will be the SD organization controlling the particular function. Organizational OPR's will be required to make inputs to the IMS OPR for the establishment and maintenance of a current data element dictionary/index for the Information System Operator's Retrieval Handbook.

The initial IMS will be an interactive Computer/Terminal Communication Network interfacing SD and NASA's common data bases. Unique information requirements between SD and other users can be incorporated into the IMS when desired.

Procedural guidance for the IMS is forthcoming and will be incorporated as an appendix to the Configuration Management Plan.

5.0 TEST AND EVALUATION (T&E)

5.1 OVERVIEW

This section presents a general description of the planning philosophy, organizational responsibilities, and test objectives for Development Test and Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E). The approach for CSOC T&E planning entails a phased sequence of events starting with Government-monitored development tests at the contractor's site and ending with Government conducted Operational Test and Evalua- tion (OT&E). IOT&E will be combined with DT&E where possible.

5.2 TEST CONCEPT

5.2.1 GENERAL

In order to evaluate specification and operational effectiveness and suitability requirements Test and Evaluation (T&E) will be of two major types, DT&E and OT&E. DT&E verification will be completed by the contractor(s) under program office direction. AFTEC will participate in DT&E to maximize the extent of separate IOT&E and to minimize combined T&E. Verification of systems-level operation and the ability to meet integrated performance criteria will be among the primary objectives.

5.2.2 TEST PLANNING

The Space Division Deputy for Space Launch and Control Systems (SD/YV) has established a Test Planning Working Group (TPWG) as an advisory body to the CSOC SPO. It will be composed of members from AFSC/SD, AFSCF, AFESC, AFCC, ATC, AFTEC, SAC, AFLC, ADCOM, and NASA. The CSOC Integration Support Contractor (CISC) and the Aerospace Corporation will also be represented in the TPWG. The TPWG will review the Test and Evaluation Master Plan (TEMP), and update it as required. The TPWG chairperson will be appointed by the Program Director. Approval authority of contractor-developed test plans and procedures resides in the CSOC Program Office. OT&E plans developed by AFTEC will be in accordance with the FMD and will be approved by AFTEC with concurrence by Space Division.

The Integration Contractor will prepare and submit a System Test Plan (STP) that covers all verification required by the System Specification. This plan will describe the contractor's approach to meeting requirements depicted by the Verification Matrix of the System Specification. Segment test plans and procedures will be developed by the individual contractors and reviewed by the CISC and the SPO.

5.3 TEST PROGRAM APPROACH

5.3.1 DEVELOPMENT TEST AND EVALUATION (DT&E)

Development testing will be conducted in three phases (A, B, and C) by the contractor( ), under SD direction, and will proceed from component level, through integrated verification of functional areas and interfaces, then to the complete system. Integration of software with hardware will begin at an early phase of DT&E. Phases A & B will be performed in-plant. Phase C development tests will then be conducted on-site at the CSOC. Results of all three phases will be used for OT&E validation where possible.

5.3.1.1 PHASE A DT&E

During this phase, in-plant tests will deal with components of hardware and software (CI and CPCI), integration of components, and tests of the complete system. Tests will be performed to verify control of hardware/software design and development. Preliminary and Final Qualification Tests will be accomplished as CPCI coding becomes complete. Results of Phase A DT&E will determine the extent of modifications, improvements, and redesign of respective subsystems.

5.3.1.2 PHASE B DT&E

This phase of the test program will be accomplished at the contractor's facility, including software tests for further verifying the quality control of design and development started in Phase A DT&E. Predetermined criteria will be used by the government to decide if shipment is authorized. Operational performance parameters will be emphasized by testing to conditions expected in an operating environment. Results of this testing phase will determine the need, if any, for testing under more stringent environments to satisfy the IOT&E effort.

5.3.1.3 PHASE C DT&E

Phase C DT&E will be conducted on-site at CSOC. The concept is to complete contractor development verification of CSOC performance parameters not verified during DT&E at the contractor's plant because of operational site dependency and integrated test requirements. These tests, including further verification of computer programs, will be conducted as a combined DT&E/IOT&E effort.

5.3.2 OPERATIONAL TEST AND EVALUATION (OT&E)

In addition to special operational tests and evaluations, OT&E will encompass observation of DT&E, simulations
using previous mission data, and real-time rehearsals using data from SOC and JSC to evaluate the operational effectiveness and suitability of CSOC in the operational environment. AFTEC, in coordination with Space Division, will plan, design, and manage OT&E. Verification of systems and operation and the ability to meet integrated performance criteria will be primary objectives.

System software will be tested for its effectiveness and suitability in meeting performance requirements. Corrective actions made necessary from test results will be taken to arrive at the final product configuration.

5.3.3 FOLLOW-ON TEST AND EVALUATION (FOT&E)

FOT&E is conducted to verify that components, equipment, and systems installed or exchanged after DT&E/IOT&E, if any, perform as those items accepted after formal DT&E/IOT&E, and that installation is proper at the CSOC operational site.

5.4 TEST MANAGEMENT

Overall test planning and management will be conducted under

direction of the CSOC SPO, using the resources of the Integration Contractor, Segment Contractors, and Aerospace Corporation as required. TPWG support in accordance with AFSC Sup 1 to AFR 80-14 will be utilized to an optimum extent. During DT&E, operating, supporting, and participating commands will be represented through the TPWG.

5.4.1 DEVELOPMENT TEST AND EVALUATION (DT&E)

For DT&E, each contractor will be tasked to effect the planning, testing, data collecting, analyzing, and reporting as necessary to verify development completeness and satisfaction of specification requirements. The Program Office will solicit comments on DT&E plans through the TPWG and its represented agencies. During contractor tests directed by the CSOC SPO, an appropriate Government team formed by the Program Office and including major participant representation, will perform monitoring functions and review test data to be made available. The DT&E management function will be provided by a test director to be designated by the Program Manager. A coordinated, integrated test procedure will reflect a mutually agreed upon effort to accomplish portions of DT&E.

5.4.2 OPERATIONAL TEST AND EVALUATION (OT&E)

AFTEC has been assigned OT&E responsibility by the PMD. Support in the form of maintenance personnel, test equipment, spare parts, and assemblies, and other necessary items will be provided by each contractor in accordance with needs defined by SD and AFTEC. A Test Program Outline (TPO) to be developed by AFTEC will identify any unique test resources required for OT&E. If appropriate, OT&E objectives not completed during DT&E will be accomplished at the CSOC location by an Air Force Test team under the management of the AFTEC Test Director.

5.5 TEST REPORTS

DT&E reports covering plans/procedures (including com- puter programs), installation, and final results will be speci- fied for delivery by each Contract Data Requirements List. The OT&E test plan will be prepared by AFTEC and submitted to the Program Office for incorporation into the combined test documen- tation. An independent OT&E report will be submitted by AFTEC on the evaluation of the operational effectiveness, suitability, and military utility of the system.

5.6 ORGANIZATIONAL RESPONSIBILITIES FOR TEST AND EVALUATION (T&E)

Some potential T&E participants are listed below. Specific responsibilities will be listed in the CSOC TEMP.

a. SD/YVO,YVA,AQ
b. Space Command
c. SD/YO,DET2,AFSCF
d. AFTEC
e. AFCC
f. Integration Contractor
g. ESC
h. Aerospace Corp.

5.7 TEST SUPPORT

5.7.1 GENERAL REQUIREMENTS

The test resources required to support CSOC tests will be tabulated in the TEMP or subordinate test plans. Preoperational supply support will be provided by the contractors through installation, checkout, and DT&E. The supply philosophy for follow-on spares is included in the logistics planning discussed in Section 9 of this plan.

5.7.3 TECHNICAL DATA

Either standard MIL-Spec manuals or a combination of these and qualifying commercial-format documentation will be acquired to support three levels of maintenance. Due to the predominance of commercial, off-the-shelf equipment, commercial documentation will predominate.

6.0 COMMUNICATIONS-ELECTRONICS

6.1 PROGRAM MANAGEMENT

Management of the CSOC Communications Segment (CS) will be the responsibility of the Space Division System Program Office (YVO) during the conceptual, definition, acquisition, and testing phases. The Program Office will acquire equipment and services during these phases from a communications segment contractor. Additionally, communications expertise will be provided by Air Force Communications Command (AFCC) during all four phases to ensure that state-of-the-art technology and standard communications practices are considered prior to the operational phase.

The early phases will require direction from operational users, the Space Command, and other support organizations through a CSOC communications working group (CWG). The CWG will be chaired by SD/YVON and will be charged with resolving administrative and technical problems involving such areas as concept definition, interfaces, switching and eventual operations and maintenance.

The management of the CSOC communications segment project through an initial operational capability (IOC) will rely on a communications segment contractor to perform installation, check-out, and pre-acceptance O&M functions under the direction of the Program Office.

Prior to IOC, AFCC will be responsible for assisting the Program Office in defining communications requirements and architecture; accomplishing source selection and evaluation activities relative to the communications segment contractor; and overseeing the services of the contractor. AFCC will also operate and maintain the Defense Satellite Communications System (DSCS) terminal and administer the leased Domestic Satellite (DOMSAT) terminal contracts. Subsequent to IOC, AFCC will continue providing the DSCS and DOMSAT service and also accomplish operation and maintenance activities which will be determined later.

6.2 COMMUNICATIONS CAPABILITIES

The communications segment capabilities of the CSOC are delineated in Section 4.0 of this PMP. Internal and external CSOC communications at the CSOC facility will be in support of the Satellite Operations Complex (SOC) and the Shuttle Operations and Planning Complex (SOPC). Additionally, the communications capabilities of the CSOC during conceptualization and design should account for other collocated systems, such as the planned NAVSTAR GPS Master Control Station (MCS). The capabilities of the CSOC and GPS MCS, although not identical, are similar and should be designed concurrently to take advantage of commonality and provide reduced cost via reduction of redundant systems. As the CSOC communications segment capabilities are defined and designed, the entire CSOC location, including the GPS MCS, should be considered as one operating location with site communications provided accordingly. Acquisition management of SD/YVO, in concert with AFCC, will require procurement installation and testing of communications equipment through the IOC phase. Following IOC, expanded capabilities will be acquired by the CSOC Program Office. Dedicated military and commercial communications circuits will be requested and funded by the Program Office prior to IOC. After IOC, the management and operation of military and commercial circuits will be the responsibility of AFCC in support of the CSOC operating agency. All military satellite communications (MILSATCOM) requirements will be submitted IAW JCS MOP 178.

6.3 TEST SUPPORT

CSOC communications test and evaluation will be carried out IAW Chapter 5 of this PMP and the TEMP for CSOC.

6.4 RADIO FREQUENCY SUPPORT REQUIREMENTS

Radio frequency requests and management will be the responsibility of SD/DC in support of the requirement identified by the Program Office. RF authorization requests will be processed IAW AFR 100-31.

6.5 COMMUNICATIONS SECURITY

Communications Security (COMSEC) management during the pre-IOC phase will be the responsibility of the Program Office in conjunction with SD/DC and ESC. COMSEC will be provided IAW para 12.3.2.4 of this PMP and AFR 100-45.

7.0 OPERATIONS

7.1 OVERVIEW

The Deputy Commander for Space Operations (DCSO or SD/YO) will plan and direct CSOC Operations and Maintenance (O&M). Contractors will maintain and operate the systems until DD250 acceptance is made and a transition from an acquisition to an operational phase occurs. The SPO will continue its acquisition role until the defined capability is achieved.

7.2 MISSION

COSC will provide a secure, dedicated Air Force Control Center that consolidates the functions of conducting DoD satellite missions and conducting DOD Shuttle operations. CSOC will support designated space vehicle missions from conceptual design through mission completion. It will be a major control node in a worldwide satellite command and control network that includes ties to NASA systems, the existing Air Force Satellite Control Facility (AFSCF) network, Eastern and Western Space and Missile centers (ESMC and WSMC), the space defense operations Center (SPADOC), and other space command and control centers. CSOC will provide a geographical and physical colocation and/or integration of major Air Force space control centers including the Satellite Operations Complex (SOC) and the Shuttle Operations and Planning Complex (SOPC). CSOC will provide the Air Force space operations with increased survivability and added flexibility by serving as a redundant control node within the Air Force common user tracking network.

The overall CSOC mission is to enhance DOD space operations capability and survivability in accordance with Presidential Directive/National Security Council PD/NSC-37 and PD-42.

Specifically, CSOC will:

a. Provide DoD with the capability to operate the Space Shuttle Vehicle (SSV) with minimal support from the National Aeronautics and Space Administration (NASA).

b. Provide a second control node for shuttle operations.

c. Augment the Satellite Test Center (STC) satellite support capability by providing a second node with similar capability.

d. Provide a common backup between the STC and CSOC, enabling essential on-orbit satellite support to be provided in case either facility becomes inoperative.

e. Provide cost-effective DoD space operations support through functional and physical integration of hardware, software, and personnel systems.

f. Facilitate the implementation of new space programs by emphasizing growth potential in the CSOC design.

g. Provide for needed addition of both Shuttle and satellite operations capacity to meet anticipated traffic growth.

h. Provide a degree of backup between NASA/JSC and CSOC, enabling essential SSV support to be provided in case either facility becomes inoperative.

i. Provide routine operational support to the colocated programs (e.g., GPS).

7.3 TRANSITION

Common user satellite control operations are currently performed at the STC, in Sunnyvale, CA, and the geographically dispersed RTSs. Shuttle control operations are currently performed at JSC and the geographically dispersed GSTDN (to be replaced with TDRSS). For national security missions, control of the shuttle and some satellite programs will transition from existing facilities to CSOC.

7.3.1 TRANSITION OF SHUTTLE CONTROL

CSOC will be initially operational to support STS flight operations by late 1987. CSOC systems, however, will have incremental IOCs, phased to provide planning, training, and flight operations support required for the first CSOC controlled flight. NASA will maintain a back-up capability to support DOD SECRET missions after CSOC IOC. Transition from JSC to CSOC is based on the following tenets:

a. DOD direct participation in JSC "Controlled Mode," operations will be through the Space Division's Manned Space Flight Support Group (MSFSG). DOD personnel trained at NASA/JSC as part of MSFSG will be later transitioned to CSOC to become a cadre for CSOC testing, training, and operational activities.

b. NASA/JSC will provide advisory and technical coordination for the design, development, and testing of CSOC hardware/software systems through the SOPC Project Office.

c. NASA/JSC configuration management systems will be used for configuration control of hardware/software elements common to both NASA and CSOC during the transition period.

d. JSC "Controlled Mode" and repeat DOD flights will be used to test and certify operational readiness of CSOC.

e. A phased, incremental approach will be used for transition of prime mission operations responsibility for DOD STS flights from NASA/JSC to CSOC. This will include CSOC support of NASA controlled DOD flights in a parallel, flight-following mode before attaining prime mission operations responsibility, and the subsequent phased reduction of NASA backup support to CSOC.

f. The nominal flight for transition of mission operations capability would be the first DOD launch scheduled for late 1987. However, the flight should ideally have the following characteristics, which might cause a later flight to be selected:

   1. It should be a repeat flight, previously flown several times in the "Controlled Mode."

   2. It should be a simple deployment mission.

3. It should be classified no higher than SECRET, to allow easier NASA coordination and NASA takeover as prime, in case of emergency, with little security risk.

7.3.2 TRANSITION OF SATELLITE CONTROL

The DCSO will designate the satellite programs to be supported by the SOC. Candidate programs to be supported by the SOC include: the Inertial Upper Stage, Shuttle sortie missions, and other projected missions. Support for these missions will commence incrementally beginning in mid 1985 with the availability of the backup MCC. The transition of program support from STC to CSOC will be less complex than the transition from JSC because it is an Air Force to Air Force transfer and involves a more exact replication of the systems and operating procedures. The acquisition and training of personnel requiring special AFSCF experience is the responsibility of the AFSCF at Sunnyvale, CA.

7.4 READINESS

The CSOC Reliability and Maintainability (R&M) program, will provide high-reliability equipment and minimize mean-time-to-repair (MTTR). Back-up equipment will also be used to enhance availability. O&M personnel training will be emphasized in order to maximize availability and readiness.

8.0 CIVIL ENGINEERING

8.1 GENERAL

Facility acquisition includes facility definition, planning, programming, design management, construction management, configuration management, and operations and maintenance planning. The Consolidated Space Operations Center (CSOC) facility requirements include technical buildings, engineering and administrative facilities, antenna facilities, utilities, and site support facilities. The site is located near Colorado Springs, Colorado, as shown in Figure 8-1, on one section (640 acres) of land. Additional surrounding land may be acquired for growth, isolation, security or accessibility.

8.2 MANAGEMENT OVERVIEW

The CSOC Program Office (SD/YVO) has overall system acquisition management responsibility and provides configuration management over all facilities. In support of the Program Office, the Space Division Director of Civil Engineering (SD/DE) is the SD focal point for facility acquisition activities. The Army Corps of Engineers (COE) is the designated DoD design and construction agent, and the Air Force Regional Civil Engineer Central Region (AFRCE-CR) will have Air Force design management responsibilties. Facilities will be accepted on completion by SD/DE and SD/YVO and will be transferred to Peterson AFB for real property records management.

8.3 FACILITY ACQUISITION MANAGEMENT ACTIVITIES

The CSOC facility acquisition process includes six phases: 1) facility programming and budgeting; 2) facility definition; 3) facility design; 4) facility construction; 5) configuration management; and, 6) operations and maintenance planning.

8.3.1 FACILITY PROGRAMMING AND BUDGETING

All CSOC facilities will be programmed and budgeted through the Military Construction Program (MCP). This activity also includes land acquisition actions for which the COE is responsible. SD/DE will oversee all MCP documentation activities, including documentation of real estate requirements.

8.3.2 FACILITY DEFINITION

The facility definition phase includes trade studies and analyses, preparation of the Facility Development Specification (FDS) and site selection. SD/YVO is responsible for technical development and baseline control of the FDS. The Deputy Commander for Space Operations (SD/YO) will provide inputs for both technical equipment and operational facility requirements. SD/DE will furnish the necessary engineering support to ensure technical adequacy and to ensure that sufficient design criteria are available for timely execution of the design. The selection process, including surveys and comparative evaluations of alternates, has been completed and resulted in the choice of a site near Colorado Springs, Colorado.

8.3.3 DESIGN MANAGEMENT

Air Force Regional Civil Engineer (AFRCE) responsibilities, as defined in AFR 89-1, for the CSOC program have been assigned to the Central Region AFRCE. The Omaha District of the U.S. Army Corps of Engineers, as the designated design agent, will administer design funding; obtain authority to use Architect- Engineer (A-E) services; prepare the A-E statement of work and selection standards; conduct A-E selections; award and execute A-E contracts; conduct design reviews; and approve designs, after AFRCE and SD concurrence, including design time schedules, costs, preliminary plan, design analyses, outline specifications, and construction cost estimates. Early COE activities have resulted in the selection of the firm of Holmes & Narver, Orange, California, as the A-E for the CSOC facility design. SD/DE will be the single point of contact in SD for the AFRCE and COE on all CSOC facility matters; participate in A-E selection, predesign conferences and design reviews; and support the AFRCE and COE in the accomplishment of design surveillance. SD/YVO will provide and maintain configuration control over design criteria and participate in design reviews.

8.3.4 CONSTRUCTION MANAGEMENT

All CSOC construction packages will be formally advertised for bid by the Corps of Engineers, resulting in firm fixed price lump-sum contracts. The COE, as the construction agency, will manage CSOC construction contracts. Air Force construction management duties include arranging for site inspections by potential construction contract bidders, ensuring that preconstruction conferences are held, determining the availability of Government Furnished Material (GFM) and contractor-procured long lead time items, performing overall construction surveillance and financial management functions, reporting the progress and status of construction, processing change orders, participating in preliminary and acceptance inspections, and ensuring the expeditious transfer of real property facilities to the Air Force. AFRCE-CR and the AF Headquarters coordinator of engineering services, HQ USAF/LEE, will exercise construction contract bid opening and award authority, review and approve all user construction contract change proposals in accordance with AFR 89-1, Chapter 12, and perform top level financial management functions. SD/DE will provide on-site AF construction surveillance.

8.3.5 CONFIGURATION AND FINANCIAL MANAGEMENT

The SD/YVO has the responsibility for performing the Integrated Configuration and Financial Management functions for all CSOC program elements. Throughout the entire acquisition cycle, SD/YVO will exercise direct control over the design criteria to ensure that the facilities are designed and constructed in a manner that is compatible with ground support system elements (support equipment, personnel, software, and consumables). SD/DE will support SD/YVO in performing these functions by participating on the Requirements Control Board (RCB) and on the Configuration Control Board after baselining, by controlling design changes to construction contract drawings and specifications, by supporting program budget submittals, by monitoring and reporting design and construction costs against budgetary and statutory

limitations, and by accomplishing all facilities design and construction management reporting actions for AFSC. SD/YO will also support SD/YVO in performing these functions by providing and updating CSOC technical and operational requirements. A Facilities Working Group (FWG), chaired by SD/YVO, is established to provide a means of evaluating changes for technical and functional validity.

8.3.6 OPERATIONS AND MAINTENANCE

SD/YVO will provide for planning, programming, and managing all operations and maintenance resources required to support CSOC. SD/DE will support this effort by accomplishing the corresponding activities for CSOC real property facilities and equipment. A Host-Tenant Support Agreement with Peterson AFB, Colorado Springs, Colorado, is required IAW AFR 11-4.

8.4 FACILITIES DESCRIPTION

CSOC facilities include land, roadways, utilities, real-property installed equipment, power plant, antenna pedestals, and buildings. The major buildings are the technical building (302,000 square feet), engineering and administrative building (122,000 square feet), central plant, support building, and several smaller antenna termal and security-related buildings. The entire building complex is enclosed in a double security fence.

CONSOLIDATED SPACE OPERATIONS CENTER SITE

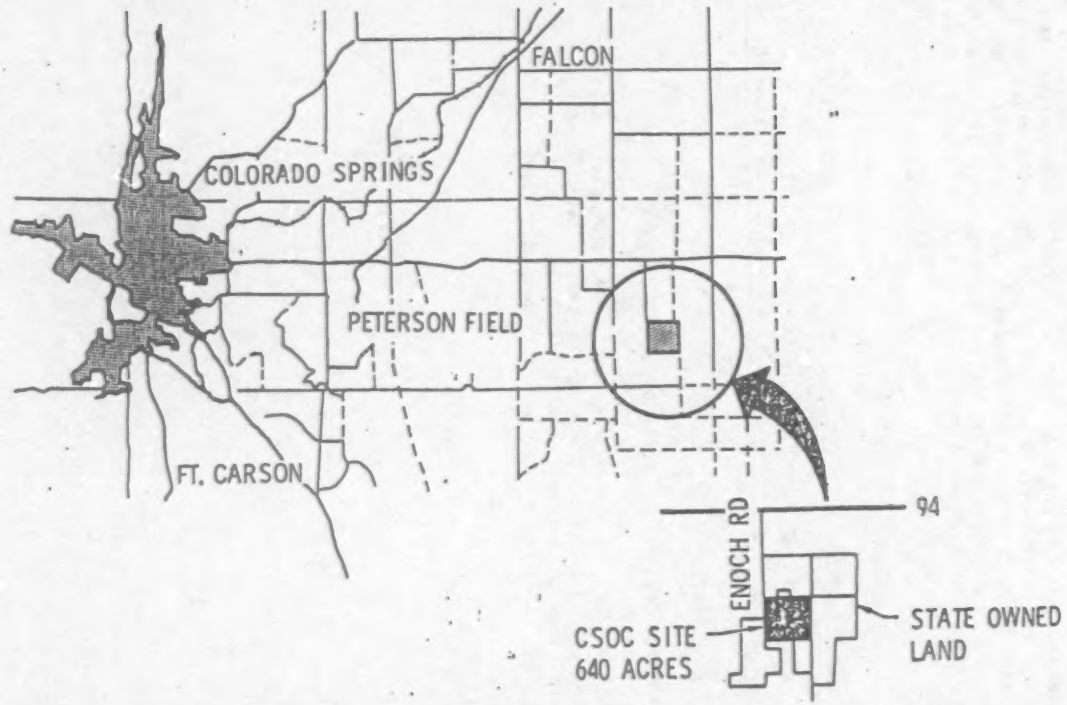

FIGURE 8-1 CSOC LOCATION

9.0 LOGISTICS

9.1 OVERVIEW

Integrated Logistics Support (ILS) will be applied to the CSOC Program in accordance with (IAW) DoD Directive 5000.39 as implemented by AFR 800-8. Logistics considerations and planning will be integrated with system design/engineering in all stages of system development where applicable and especially in newly developed items. This section summarizes logistics planning. Detailed logistics planning will be documented in the CSOC Integrated Logistics Support Plan (ILSP).

9.2 ORGANIZATION

The CSOC Program Office will conduct, an ILS program as directed in the PMD. AFLC has been identified as a supporting command and, within AFLC, the Sacramento Air Logistics Center (SM-ALC) has been assigned primary logistic support responsibility for the CSOC Program. Logistics inputs from all agencies will be provided through the Deputy Program Manager for Logistics (DPML) SD/YVL.

9.3 LOGISTICS SUPPORT POLICY

Overall logistic management will be the responsibility of the SPO (DPML) during the acquisition phase of CSOC. The turnover of operations to Space Command will be incremental as development and upgrading activities are completed. The mix of organic versus contractor logistic support will be planned with the goal of moving toward a high level of organic support.

Logistics planning and coordination will be accomplished by (SD/YVL). An Integrated Logistics Support Management Team (ILSMT) will be formed. Other working groups that will impact the logistics effort include the Test Planning Working Group (TPWG) and the Computer Resources Working Group (CRWG).

9.4 LOGISTICS SUPPORT FUNDING

The SPO will budget and fund development, fabrication, production, testing, and contractor test support for CSOC. Additionally, AFSC will fund for Peculiar Support Equipment, Engineering Data, development of Technical Orders, first destination transportation and handling costs, contractor support through installation, checkout, and transition phases approved ECPs, and residual tasks negotiated and documented in the O&M and PMRT or other transfer agreements.

AFLC (SM-ALC) will budget and fund for initial and replenishment spare and repair parts, common support equipment,
second destination transportation and handling, if any; provisioning data and associated provisioning costs, depot maintenance after turnover, and selected tasks negotiated and documented in the PMRT or other transfer agreement.

Space Command as the operating agency will budget and fund for modification, renovation, removal and construction of real property facilities, Contract Technical Service (CTS) at the Center, organizational and intermediate maintenance after turnover, and maintenance administration during the DT&E and OT&E period.

9.5 MAINTENANCE CONCEPT

A maintenance concept will be developed IAW AFR 66-14 and referenced herein. After installation and checkout, contractor representatives will continue to provide technical assistance and support during a transition phase while assigned maintenance personnel are trained. Follow-on maintenance and support will consist of a mix of organic (in-service civilian and Air Force) and contractor personnel, based on analysis by Space Command, the CSOC SPO, and AFLC representatives.

9.5.1 ORGANIZATIONAL MAINTENANCE (ON-EQUIPMENT)

Organizational Maintenance includes scheduled and unscheduled, preventive and corrective actions required to inspect, service, calibrate, remove, and replace components, in-place repair and modification, and verification of subsystems and associated components.

Maintenance will be primarily accomplished by using automatic fault isolation equipment to isolate faults to a Line Replaceable Unit (LRU). Organizational maintenance will be the responsibility of Space Command and will be performed by maintenance skills defined in the Maintenance Concept and ILS documents.

9.5.2 INTERMEDIATE MAINTENANCE (OFF-EQUIPMENT)

Intermediate Maintenance is performed in direct support of organizational level maintenance and involves disposition, repair, service, modification, calibration and verification of items removed during organizational maintenance. This includes periodic and corrective maintenance and refurbishment of the CSOC.

Intermediate maintenance is the responsibility of Space Command and will be performed as defined in the Maintenance Concept and ILS documents.

9.5.3 DEPOT MAINTENANCE

Depot Maintenance is performed by designated maintenance sources, usually the manufacturer, vendor, or government depot. It normally consists of maintenance that requires equipment, facilities, or skills that are not economically available at the intermediate level.

Space Command and/or SM-ALC will provide organic or contractor depot-level maintenance capability for all parts, assemblies, sub-assemblies, components, and end items, as well as emergency manufacture of unavailable parts. The RLA will be a prime factor in determining components to be SMR coded for depot maintenance.

9.5.4 SOFTWARE MAINTENANCE

Operational and mission software/firmware maintenance after turnover will be managed by Space Command. Depot maintenance software for Depot test operations will be managed by the designated agencies or contractor Depot Level manager. Details related to the software and firmware support concept are identified in the Computer Resources Integrated Support Plan (CRISP) and in the CSOC Configuration Management Plan.

9.6 SUPPLY SUPPORT

A supply-support concept will be established by the Program Office. Plans will be developed, with AFLC, to determine the most effective spares strategy through organic or contract support.

Preoperational supply support will be provided by the integration or associate contractors through installation and checkout of each subsystem. The contractors will also be responsible for supply support at the Center during the Center activation period, except where spares, repair parts, or material are designated to be provided as GFE.

9.7 SUPPORT EQUIPMENT

Support equipment will be acquired IAW AFR 800-12 to support the three-level maintenance concept. Both Common Support Equipment (CSE) and Peculiar Support Equipment (PSE) are expected to be needed to satisfy CSOC Program requirements. Since design austerity and life cycle costs are key

program considerations, however, CSE will be used to the maximum extent in an effort to reduce the amount of PSE to be developed. Support equipment to support software maintenance will also be needed.

9.8 TECHNICAL DOCUMENTATION

Technical manuals will be acquired IAW AFR 8-2 and AFR 310-1 to support three levels of maintenance. Existing commercial manuals will be used where possible for economy. Technical manuals will be either MIL-Spec, or a combination of MIL-Spec and best-commercial-practices documentation, and will be CDRL-specified and/or SPO-approved. The need for system engineering and reacquisition data will be assessed, and acquisition will be made if appropriate.

9.9 TRANSPORTATION AND HANDLING

9.9.1 GENERAL

The most effective means of transportation will be used consistent with delivery dates, supply priority, physical characteristics, and any geographical problems that may be involved. Shipments of materials to support the program will be handled in accordance with AFM 75-1 and AFM 75-2. Military Standard Transportation and Movement Procedures (MILSTAMP), DOD 4500-32R, will apply to all shipments moving within the DOD transportation system.

9.9.2 TRANSPORTABILITY

Transportability constraints of MIL-P-9024G shall be considered in the design of parts and equipment. Specifically, equipment components shall be capable of being transported by any available means without modification to the transporting system or unusual equipment preparation.

9.9.3 PRESERVATION, PACKAGING AND PACKING (PPP)

Packaging and Packing will be in accordance with MIL-STD-794 and MIL-P-9024. Marking will be in accordance with MIL-STD-129H. Prior to initiating engineering design efforts for reusable containers, a search of the supply system shall be made in accordance with MIL-STD-1510.

9.10 PERSONNEL TRAINING

CSOC O&M personnel training will be managed by ATC. O&M training will include depot level training requirements as required. Training equipment will be supported in a manner which satisfies training including simulation schedules. A total training summary is reflected in Section 11 of this PMP.

9.11 FACILITIES

Planning efforts will address facility requirements to accommodate all CSOC maintenance and supply support activities. Special power and environmental requirements needed for testing, repairing, and storage of material will be included. A CSOC facility summary is included in Section 8 of this PMP.

9.12 PROGRAM MANAGEMENT RESPONSIBILITY TRANSFER (PMRT)

A recommendation for PMRT will be developed in conjunction with AFLC and referenced in a later revision of this PMP.

10.0 MANPOWER AND ORGANIZATION

10.1 INTRODUCTION

The role of the CSOC Program Office is twofold. During the formal acquisition period, the System Program Office (SPO) must implement CSOC while concurrently assisting the user in providing for the transition of selected satellite and Shuttle missions to CSOC control. After initial operations, upgrading to the defined capability will take place concurrently with the conduct of mission operations. The CSOC acquisition and implementation program will be managed by the CSOC SPO and turned over to Space Command for operation. A time-phased staffing concept is presented in this section.

10.2 SYSTEM PROGRAM OFFICE (SPO) ORGANIZATION

The SPO will be structured to make full use of contractor support during the acquisition and implementation phases to accommodate any government staffing shortages while retaining program management and control. The organization is depicted in Figure 10-1.

10.3 PROGRAM OFFICE PERSONNEL REQUIREMENTS

An estimate of SPO and SD staff required to support the CSOC Program is presented in Table 10-1. Titles and corresponding specialty codes are presented for personnel within the Space Division. Technical support personnel external to Space Division such as AFCC, ESC, and AFTEC are not included.

10.4 O&M ORGANIZATION AND STAFFING

The Activation Task Force will activate the CSOC at Colorado Springs with contractor staffing and a small cadre of Air Force and civilian personnel. A phased transition to Space Command will then be made. Staffing requirements will be based on estimates compatible with the following CSOC functions:

Table 10-1. Program Office Staffing

DUTY TITLE	AFSC	GRADE	NUMBER
Electrical Engineer	2825	Maj	1
Mechanical Engineer	2835	Capt	2
Acquistion Project Officer	2724	Capt	10
Staff Development Engineering Manager	2816	Lt Col	4
Staff Development Engineering Manager	2816	Maj	6
Electrical Engineer	2825	Capt	4
Astronautical Engineer	2845	Capt	6
Project Engineer	2895	Capt	8
Communications Systems Officer	3024	Capt	1
Communications-Electronics Systems Staff Officer	3016	Maj	1
Communications Engineering Officer	3055	Capt	1
Computer Systems Development Officer	5135	Capt	8
Civil Engineering Staff Officer	5516	Maj	1
Civil Engineering Officer	5525	Capt	2
Security Police Officer	8124	Capt	1
Acquistion Project Officer	2724	Civ	4
Staff Development Engineering Manager	2816	Civ	2
Project Engineer	2895	Civ	1
Acquisition Contracting/Manufacturing Staff Officer	6516	Civ	3
Production/Manufacturing Officer	6524	Civ	1
Acquisition Contracting Officer	5634	Civ	4

Manufacturing Engineering Officer	6544	Civ	1
Logistics Plans and Programs Officer	6624	Civ	1
Budget Officer	6736	Capt	1
Cost Analysis Officer	6746	Civ	1
Contracting Clerk	65150	Civ	2
Administrative Specialist	70250	Civ	9
Administrative Specialist	70250B	MSgt	1
Communications-Electronics Systems Staff Officer	3016	LtCol	1
Computer Systems Staff Officer	5116	Maj	1
Logistics Plans Superintendant	66190	SMSgt	1
Graphics Specialist	23151	Civ	1
Staff Financial Officer	6716	Maj	1
Aeronautical Engineer	2855	Capt	1
Logistics Plans & Programs Officer	6624	Capt	1
Engineering Assistant Spuerintendant	55390	SMSgt	1
Engineering Assistant Technician	55370	MSgt	1
Acquisition Staff Officer	2716	LtCol	2
Acquisition Staff Officer	2716	Maj	2
Total			100

* Includes core SPO, SOPC Project Officer, SOC Project Office, and SD and YV staff functions.

1. Equipment operation, controlling, and updating.
2. Hardware maintenance, repair, and upkeep.
3. Software maintenance and modification.
4. Center housekeeping and mission facility maintenance.
5. Limited maintenance and operation of power, heating, water, and sewer systems.
6. Security of site perimeter, center facility, and selected internal functions.
7. Security of data, materials, and information.
8. COMSEC accounting and safeguarding.

The currently authorized O&M staffing requirements follow a trend as indicated in Figure 10-2 to a level of approximately 1700 persons, including contractor personnel, at initial operations and about 2000 when the PMD-defined capability is attained. The personnel mix in the operational era is planned to be 52% Air Force, 23% Civil Service, and 25% contractor. The goal is to achieve the highest degree of organic staffing consistent with cost effective operation of CSOC. The O&M staffing and organization requirements will be defined during the CSOC acquisition phase and will be presented in later revisions of this PMP.

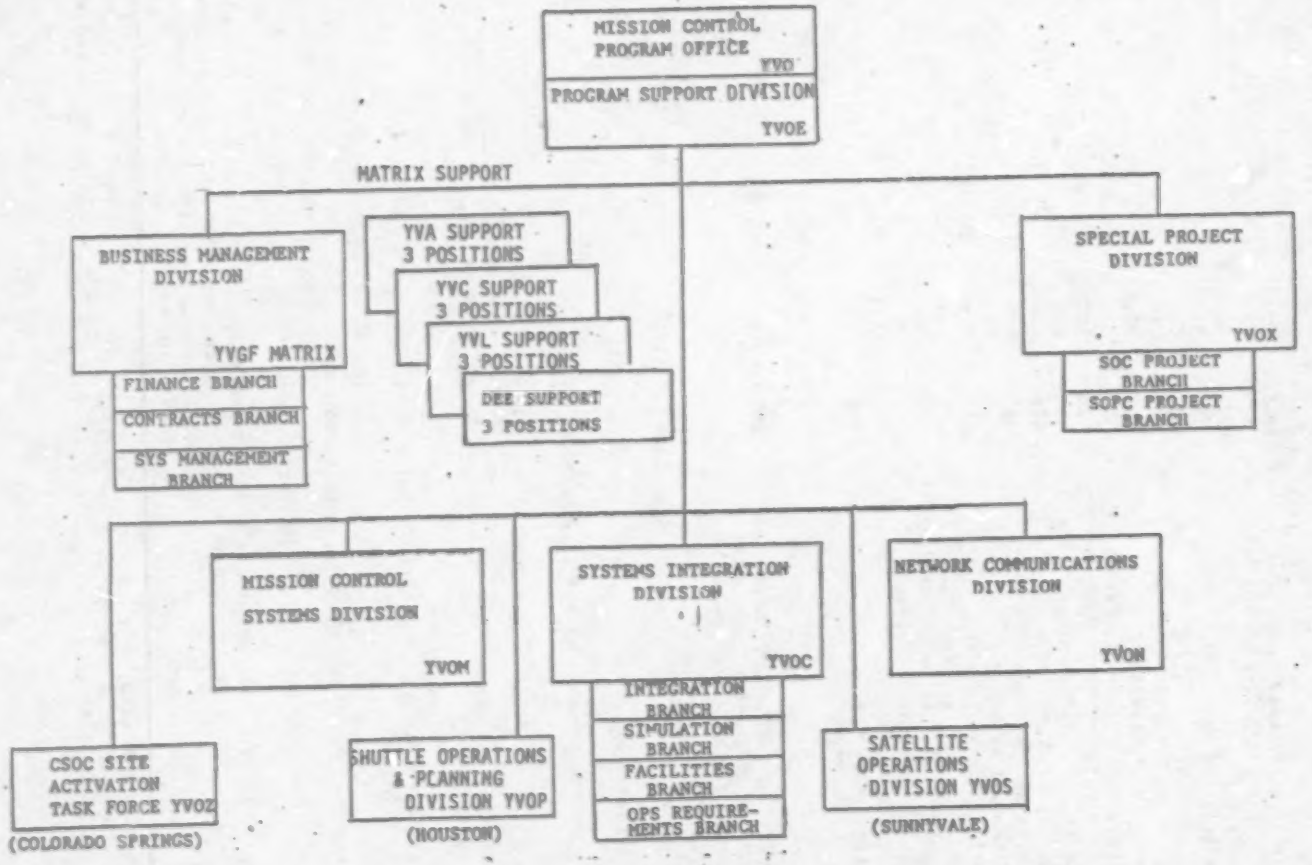

FIGURE 10-1 PROGRAM OFFICE ORGANIZATION

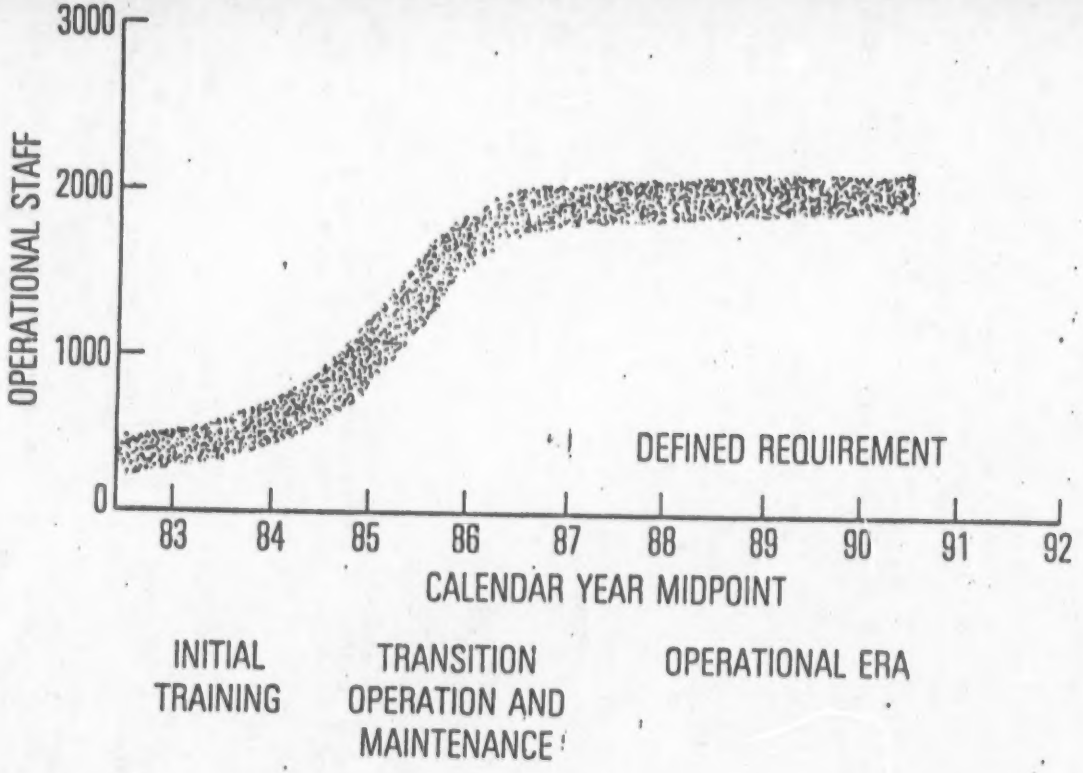

FIGURE 10-2 AUTHORIZED O&M STAFFING

11.0 PERSONNEL TRAINING

11.1 INTRODUCTION

Technical Training at the CSOC presents a number of requirements which are unique relative to most Air Force training. CSOC will support selected training of Space Shuttle flight crew members, flight operations support personnel, and the technical systems operations and maintenance personnel. The general plan is to provide this training through a combination of contractor training, participation by NASA/Johnson Space Center and the AFSCF, and training by the Air Training Command (ATC)

Activities at the CSOC will be specialized, and the availability of personnel trained to perform required tasks will be limited. Military personnel with prerequisite skills are in short supply and high demand. Therefore, the CSOC must provide specialized training in a wide variety of skill areas. In addition, the USAF plans to maximize the ratio of military to civilian personnel at the CSOC. The training concepts presented here are applicable to military, DOD Civil Service, and contractor personnel.

This issue of the PMP is being developed prior to the release of formal CSOC Training Plans. These plans will heavily influence the concepts presented in this section; therefore, Personnel training is treated generally in this plan. More details will be provided in formal CSOC training plans.

The plan for acquiring facilities to support personnel training is summarized in the paragraphs below.

11.2 TRAINING REQUIREMENTS

Personnel training at the CSOC generally falls into one of three broad categories: Flight Crew Training; SOC and SOPC Flight Operations Support Personnel (FOSP) training; and CSOC technical system Operations and Maintenance training.

11.2.1 FLIGHT CREW TRAINING

The Air Force plans for the CSOC eventually to have partially self-contained capability to train Military Shuttle flight crews. The controlled mode training capability at JSC does not satisfy the security requirements of national priority missions. Initially, NASA will provide much of the flight crew training, and the CSOC will provide only mission-specific training. Initially, CSOC training will be heavily oriented toward the CSOC operations support personnel and toward the payload specialist. The transition plans anticipate that early CSOC missions will be relatively simple (e.g., GPS deployments); therefore, payload-specialist involvement may be minimal. As the CSOC matures and as interaction between payload specialists and shuttle payloads increases, flight-crew training at the CSOC will become more comprehensive. Though NASA will continue to provide initial forward-flight-deck crew training, CSOC will have capability to conduct proficiency training and integrated rehearsals involving the forward-deck crew. Payload specialist training at the CSOC will be coordinated with the payload SPOs who may provide some training at payload contractor facilities.

11.2.2 FLIGHT OPERATIONS SUPPORT TRAINING

The training for the Flight Operations Support Personnel is divided into two basic categories - shuttle operations and satellite operations. Each of these two categories requires transition training, initial certification training, and certification maintenance training.

11.2.3 TRANSITION TRAINING

Transition training is given to personnel transitioning from the STC or JSC to the CSOC, and instruction is individualized to account for the trainees levels of applicable knowledge and skill.

11.2.4 CERTIFICATION TRAINING

Initial certification training is given to newly assigned trainees to qualify them to perform a particular job. Trainees are assumed to have the prerequisite background of education and experience. This certification training provides a program of formal classes, self study, simulations, rehearsals, on-the-job training, etc., aimed at bringing the trainee to the required level of competency in the appropriate areas.

Certification maintenance training provides, to qualified specialists, the necessary training to ensure continuing proficiency in all facets of their speciality. It also provides the training required as a result of changes to the systems with which they work.

11.2.5 SATELLITE OPERATIONS SUPPORT TRAINING

The training program for satellite operations support personnel will be similar in many ways to the STC's program, which is currently being revised to meet the requirements of the Data System Modernization (DSM). Because of the importance of

interoperability between the SOC and the STC, and the fact that the SOC is basically a replication of the STC's DSM, only small differences are expected in the training requirements for STC and SOC personnel. These differences will be related to the interaction between SOC and the total CSOC system.

11.2.6 SHUTTLE OPERATIONS SUPPORT TRAINING

In contrast to the similarities between SOC and STC training, CSOC training programs for shuttle operations personnel will be very different from those at NASA/JSC. Several factors account for these differences. First, NASA positions are staffed by engineers and scientists, while the Air Force expects to staff the SOPC with personnel possessing a more general background. Additionally, NASA personnel generally are trained on systems they have helped design, and they progress through a series of positions over a period of time encompassing a full career. However, the Air Force must train its personnel quickly to achieve maximal utilization of expertise before the specialist is transfered to another job assignment outside the CSOC. Thus, in a four-year tour, the Air Force can expect only three years of productive effort from a company grade officer. Field grade officers, on the other hand, may have had related experience with other space operations activities, such as the STC, SAC, etc. They should be capable of more rapid training for the positions of higher and broader responsibility, thereby providing a higher productivity rate.

The SOPC training program will contain formal courses directed to the specifics of the various operational assignments. On-the-job training will be structured and managed to give the trainee a range of experience as broad as possible in the shortest period of time. Computer-aided instruction will be employed in the allow trainees to progress at a pace comensurate with individual learning rates. Incentives will be provided to the trainees for increasing their pace of learning so as to obtain a higher degree of productivity during their CSOC tour of duty.

11.2.7 SYSTEM OPERATIONS AND MAINTENANCE TRAINING

CSOC technical system operations and maintenance training typically will involve computer and communications operations personnel and maintenance personnel responsible for computers, displays, timing, and communications systems. The minimal requirements for these personnel at the CSOC will be completion of courses equivalent to ATC Type 2 training. Some field experience probably will also be required. Training for

these personnel will consist principally of familiarization with specific CSOC equipment and any special operations instruction required for working in the CSOC environment.

11.3 TRAINING METHODS

The acquisition program will provide a CSOC training facility which supports the general requirements stated above. The specific requirements will be generated by the Space Command and will be described in the transition and training plans. The SPO and ATC will implement these requirements by contracting for the development of the necessary facilities, equipment, and services. System specifications will be developed in coordination with the AFSCF, Detachment 2 (MSFSG), the SOPC Project Office in conjunction with NASA/JSC, and ATC.

11.3.1 TRAINING FACILITIES

The training facility will include, but will not necessarily be limited to the following:

- Physical facilities to house required simulation devices, part-task trainers, and data processing equipment dedicated to training. Classrooms, auditoriums, conference rooms, self-study areas, instructor and staff offices, data and document storage areas and vaults, and equipment maintenance areas will be provided.

- Simulation devices, part-task trainers, and mock-ups required to train flight crew members, SOPC and SOC flight operations support personnel, and CSOC technical equipment operations & maintenance personnel.

The acquisition of training facilities and equipment will be phased to match the expansion of capabilities at the CSOC, to meet the needs for training as the mission support demand matures, and to postpone the acquisition of high-value items to the years where they are needed in order to meet the budget planning requirements. The Shuttle simulation capability is the single most expensive training item, and, as such, will be acquired in phases. Its design will ensure that each portion required meets training and other requirements in terms of personnel to be trained and tasks relevant to that time period, and that successive acquisitions build logically on those already delivered. Initial acquisition of simulation and training equipment will specifically support: (a) initial certification training of flight operations support personnel: (b) the transition of operations personnel from the STC and from JSC controlled mode operations; (c) the requirements for O&M training of equipment technicians; and (d) flight crew training for on-orbit tasks associated with early Shuttle flights, particularly tasks to be performed by the Mission and Payload Specialists. Early training at the CSOC on Shuttle operations will make maximal use of real-time and/or recorded data provided by the NASA/JSC Shuttle Mission Simulator.

In addressing the simulation requirements, the SPO will ensure that other simulator requirements to support the CSOC system checkout and the various mission readiness functions such as data and procedures validation, are properly prioritized into the acquisition.

11.3.2 TRAINING STAFF

Training will be provided by a CSOC training staff comprising military, civil service, and contractor personnel. The CSOC SPO will acquire required contractor training support directly or through ATC as determined by the requirements developed in the transition and training plans. The CSOC organic training capability may be augmented by an ATC Field Training Detachment or Mobile Training Team.

11.4 SECTION UPDATE

Future revisions of this section will specifically address the following topics:

- Types, location, and key dates of individual training courses
- Major items of required training equipment with acquisition schedules
- Transition, initial, and replacement training loads, and schedules for the first 5 years of operations.

12.0 SECURITY

12.1 OVERVIEW

The responsibility for ensuring that CSOC is developed and acquired as a secure and survivable system lies with the Program Office. The Directorate of Security, SD/SP; Aerospace Corp.; and the Integration Contractor will provide the principal technical advisors. Additional technical advice will be provided by the Deputy Commander for Space Operations, SD/YO; Communications Electronic Systems Division Base Installation System Security Program Office, ESD/OCB; and Air Force Office of Special Investigations, AFOSI. CSOC Security will be addressed very early in the acquisition program. A system security engineering program will be established in accordance with AFSCP 207-1, managed by the SPO.

12.2 SECURITY SUPPORT

12.2.1 CLASSIFICATION GUIDANCE

12.2.1.1 A CSOC Security Classification Guide is not currently being developed because there were insusfficient CSOC-unique requirements. Existing guides of the AFSCF, STS, payload programs and other interfaces will be referenced. Whenever sufficient CSOC-unique classification requirements are established a guide will be written.

12.2.1.2 The Program Office, in coordination with SD/SP, SD/YO, SD/YVA and pertinent payload program offices will be responsible for preparing additional detailed security classification guidance.

12.2.1.3 The CSOC Program Contracting Office, SD/PMVS, in coordination with SD/YVO, SD/SP, SD/YVA and pertinent payload program offices will be responsible for preparing DD Form 254, Contract Security Classification Specification. The Program Office will ensure that the form is current.

12.2.2 SECURITY REVIEW FOR PUBLIC RELEASE OF INFORMATION

Requests for public release of information will be processed according to applicable USAF regulations or the procedures contained in appropriate security classification guides. At Space Division the Office of Public Affairs, SD/PA has primary responsibility.

12.2.3 RELEASE OF INFORMATION TO FOREIGN NATIONALS

Requests for release of information to foreign nationals, foreign governments or international organizations will be processed through the Foreign Disclosure Office, SD/SPI.

12.2.4 PERSONNEL SECURITY

Clearances up to Top Secret will be required for military and DoD civilian personnel. Requests for clearance or upgrades of clearances will be processed according to USAF regulations. At Space Division clearance requests will be processed by SD/SPIA.

12.2.5 INDUSTRIAL SECURITY

Several contractors will be involved in the acquisition and activation of CSOC. These contractors will require access to classified information and will be subject to the DOD industrial security program. SD/SPI will monitor compliance with the industrial security program for contractors under the cognizance of Space Division.

12.3 SYSTEM SECURITY

Security will be integrated into the acquisition process to meet the program objectives in a cost-effective manner. A system security engineering program will be established IAW draft AFSCP 207-1. Table 12-1 indicates some of the system security requirements and the offices responsible for definition and approval.

TABLE 12-1 System Security Engineering Requirements

Requirement	Approve
Security Operations Concept	SPO DIR.
System Security Requirements	SPO DIR.
System Security Standard	AFOSP
Survivability Plan	SPO DIR.

In addition to the requirements listed in table 12-1, security specifications will be developed as an integral part of the acquisition specification.

12.3.1 DESIGN INFLUENCE

12.3.1.1 CSOC has been designated a Priority A resource in accordance with AFR 207-1. SD/SP is developing a preliminary System Security Standard which will be used as a source of requirements for facility design, system/equipment specifications and manpower.

12.3.1.2 The Program Office through the integration contractor, will conduct a vulnerability analysis of the system. This analysis will be a source of security specifications to design out or compensate for vulnerabilities identified.

12.3.1.3 The Program Office will develop security specifications based on security criteria and the vulnerability analysis. In developing those criteria, trade off analyses will be performed considering cost, schedule, performance and technology.

12.3.1.4 The System Security Program will be designed to protect mission critical resources and classified information by providing positive control over authorized entry to the facility and circulation control within the facility; preventing overt, covert, or clandestine entry by unauthorized personnel; detect, assess, discriminate, interdict, and neutralize hostile forces seeking to damage or destroy the facility; minimize manpower requirements; and minimize constraints on mission operations.

12.3.2 OPERATIONAL SECURITY REQUIREMENTS

12.3.2.1 The Program Office, in coordination with SD/YO and SD/SP will propose generic countermeasures for residual vulnerabilities not amenable to correction by the engineering and design process.

12.3.2.2 An extensive amount of security equipment will be acquired. Exterior and interior sensor systems, automated entry control devices, security fencing, lighting, an entry control facility, armored response vehicles, closed circuit television, a central security control facility, and an Alert Force Response facility have already been identified as generic requirements. Some of these will be procured as an integrated portion of the facility. Others must be procured separately. Government furnished equipment will be emphasized, but

state-of-the-art requirements may make contractor furnished equipment more desirable. ESD/OCB will provide technical advice on sensor systems. To the greatest extent practical, security facility and equipment requirements will be integrated into the overall CSOC acquisition process.

12.3.2.3 OPSEC

The principles of operations security will be addressed in the CSOC acquisition process and a formal OPSEC program developed in accordance with AFR 55-30 and AFSC Supplement 1. A CSOC Systems Operational Concept will be developed to conform with AFR 52-1.

12.3.2.4 COMSEC

The Program Office will determine CSOC COMSEC requirements from early analyses of AFSCF and JSC configuration and CSOC requirements. Cryptologic security, transmission security, physical security of COMSEC materials and information, and the control of compromising emanations (TEMPEST) will be the major areas of interest. These requirements will be submitted to ESC through HQ AFSC in accordance with AFR 100-45. Standardization and interoperability with AFSCF, JSC and other interfaces will be considered within the baseline of minimal acceptable security requirements. SD/YVON will provide CSOC technical advice, supported by SD/DC.

12.3.2.5 ADP SECURITY

The Program Office will ensure that all CSOC ADP systems meet the requirements of AFR 300-8 and have been approved by a Designated Approval Authority prior to classified operations.

13.0 APPLICATION OF DIRECTIVES

The following documents are required for management of the CSOC program:

a. Mission Element Need Statement, Subject: DOD Shuttle Control Capability, approved 29 Sep 79 (S).

b. Mission Element Need Statement, Subject: Satellite Control Capability, approved 29 Sep 79 (S).

c. Presidential Directive NSC-37, Subject: National Space Policy, 11 May 1978 (TS).

d. Presidential Directive NSC-42, Subject: Civil and Further National Space Policy, 10 Oct 78 (S).

e. Presidential Directive NSC-53, Subject: National Security Telecommunications Policy, 15 Nov 79.

f. Air Force Satellite Control Facility Security Classification Guide, Aug 79.

g. Space Transportation System Security Classification Guide, Aug 79.

h. NASA/DOD Memorandum of Understanding on Management and Operation of the Space Transportation System, 27 Mar 80.

i. SECDEF Memorandum to SAF, Subject: DOD Shuttle and Satellite Control Capabilities, 29 Sep 79.

j. AF/CC Letter, Subject: AF Satellite Control Policy, 27 Mar 82.

The following documents relate to the CSOC program:

a. PMD No. R-S 9038( )/PE 35110F, Air Force Satellite Control Facility Improvement and Modernization Program, latest edition.

b. PMD No. R-S 5068( )/PE 63411F/12449F, DOD Space Transportation System Acquisition Activities, latest edition.

c. PMD No. R-S 4068( )/PE 63428F, 63438F, 64406F, 12311F, 12405F, 12424F, Space Defense Operations Center, latest edition.

d. PMD No. R-S 7123( )/PE 35171F, Space Launch Support, latest edition.

e. Air Force Satellite Control Facility Test and Evaluation Support Resource Plan, FY 82 - FY 86, RCS-SYS-TEU(A)7603, (S).

f. HQ USAF Report on the Site Selection for the Consolidated Space Operations Center, December 79.

g. ASD (C3I) Memorandum for SAF, Subject: Space Defense Operations Center, 1 March 79.

h. HQ USAF Report to the Office of Management and Budget on the Satellite and DOD Shuttle Control Capabilities, August 79 (S).

i. Shuttle Mission Operations Task Force Evaluation (SMOTE) Report, HQ USAF, July 79 (TS).

j. AF Satellite Control Plan Briefing, Dec 81.

k. PMD No. R-S 4075( )/PE 64778F/35164F/35165F, Global Positioning System, latest edition.

l. PMD No. R-S 3015( )/PE 35160/35162F, Defense Meteorological Satellite System, latest edition.

Numerous other compliance and reference documents, appropriately tailored, are contained in the following:

a. CSOC System Specification SS-CSOC-00001

b. SOC System Segment Specification SSS-CSOC-00002

c. SOPC System Segment Specification SSS-CSOC-00003

d. COMM System Segment Specification SSS-CSOC-00004

e. Facilities System Segment Specification SSS-CSOC-00005

f. Support System Segment Specification SSS-CSOC-00006

g. Validation System Segment Specification SSS-CSOC-00007

h. Network Control System Segment Specification SSS-CSOC-00008

i. Request for Proposal for CSOC Integration Support Contract RFP F04701-81-R-0051.

j. Request for Proposal for CSOC Communications Contract RFP F04701-82-R-0017.

k. Consolidated Space Operations Center Task Force Final Report, Dec 1980.

l. Consolidated Space Operations Center Definition and Requirements, 20 Oct 1981.

m. CSOC System Security Concept, AFSC/SD YVO, 15 June 1981.

APPENDIX A
Acronyms and Definitions

ADC	Aerospace Defense Command
ADPE	Automatic Data Processing Equipment
AFSCF	Air Force Satellite Control Facility
ATC	Air Training Command
AFTEC	Air Force Test and Evaluation Center
AWS	Air Weather Service
BOD	Beneficial Occupancy Date
CAPS	Crew Activity Planning System
CCB	Change Control Board
CCS	Command and Control Segment
CI	Configuration Item
CM	Controlled Mode
COMSED	Communications Security
CPCI	Computer Program Configuration Item
CPU	Central Processing Unit
CRP	Configuration Requirements Processing
CSOC	Consolidated Space Operations Center
DCSO	Deputy Command for Space Operations (Space Division YO)
DSM	Data System Modernization
DT&E	Development Test and Evaluation
ECM	Electronics Countermeasures
EMC	Electromagnetic Compatibility
ESMC	Eastern Space and Missile Center
ET&E	Engineering Test and Evaluation
EW	Electronic Warfare
FCE	Flight Control Element
FCR	Flight Control Room
FDF	Flight Data File
FOT&E	Follow-On Operational Test and Evaluation
FS	Facilities Segment
FS	Flight Specification

GFE	Government Furnished Equipment
GSE&I	General Systems Engineering and Integration
GSFC	Goddard Space Flight Center
ICC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
JSC	Johnson Space Center
LCC	Life Cycle Cost
LRU	Line Replaceable Units
MCC	Mission Control Comples
MCP	Military Construction Program
MOA	Memorandum of Agreement
MOS	Mission Operations System
MSFSG	Manned Space Flight Support Group
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
NASA	National Aeronautics and Space Administration
O&M	Operatins and Maintenance
ODDL	On-Board Digital Dataload
OOMS	On-Orbit Mission Simulator
OT&E	Operational Test and Evaluation
PAT&E	Production Acceptance Test and Evaluation
PMCC	Payload Mission Control Center
PMD	Program Management Directive
RTS	Remote Tracking Station
SMS	Shuttle Mission Simulator
SOC	Satellite Operations Complex
SOPC	Shuttle Operations and Planning Complex
SPADOC	Space Defense Operations Center
SPO	System Program Office (Space Division YVO)
SSV	Space Shuttle Vehicle
STC	Satellite Test Center
STS	Space Transportation System
TDC	Technical Data Center
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan

JOINT CIVILIAN-DOD PAYLOAD MISSIONS

Senator SCHMITT. One final question, Mr. Secretary: You suggested, I think, in your testimony that the CSOC could handle joint civilian-DOD payload missions?

Mr. ALDRIDGE. That is correct.

Senator SCHMITT. Does that mean you are going to propose to handle them? If not, why is the design configured that way?

Mr. ALDRIDGE. The problem with Johnson is that you either have to run classified payloads or unclassified payloads; you cannot mix the two. The CSOC computer design will allow that to happen by having a different management system for each.

Senator SCHMITT. Under what circumstances would that happen? Would that mean at any time there is a decision to fly a Defense payload on a mission that contains civilian payloads that it will be operated out of CSOC.

Mr. ALDRIDGE. Yes, sir; it could be after 1985; it could not be done out of Johnson. You would either have to clear the unclassified payload in a classified area or fly the DOD payload in an unclassified mode.

Our plan of attack would be that CSOC would have a capacity to fly mixed payloads by providing a security arrangement in the computer system for the management of the payload.

If after 1985 the Air Force had a payload in which the Shuttle were only half utilized, we could, in fact, put a civil payload on board and fly it out of CSOC.

Senator SCHMITT. General Randolph, what is the plan for simulators at CSOC?

General RANDOLPH. We plan to have a simulator similar to the one that they have at Johnson.

Senator SCHMITT. Are you talking about the Shuttle simulators?

General RANDOLPH. A specific Shuttle simulator; also, the simulation capacity at mission control center for satellites.

PROJECTED SIMULATOR COSTS

Senator SCHMITT. What is the cost projected for the simulator?

General RANDOLPH. I don't have those but will provide them for the record.

[The information follows:]

CONSOLIDATED SPACE OPERATIONS CENTER

The current estimate for the Fixed Base Crew Station is $171 million for development and acquisition.

BACKUP SATELLITE CONTROL FACILITY

Senator SCHMITT. Mr. Chairman, there is an area of disagreement here. I will look forward to receiving the detailed plan submitted for the record on cost breakdown. I think the committee ought to do everything they can to see that there is a backup satellite control facility initiated within the most prudent possible time.

As you have gathered, I am tremendously concerned that the Air Force underestimates the requirements that are going to appear for the remainder of that facility.

ADDITIONAL COMMITTEE QUESTIONS

I also for the record will submit some questions that I hope will further illuminate some of the questions that I have already raised.

I appreciate, again, Mr. Chairman, your consideration of my being with you this morning.

Senator LAXALT. I have enjoyed having you here. I think you have contributed materially to the discussion.

We will prepare a transcript on this. We would like the information that we have requested. I will assure the Air Force in connection with the design problem that we will get to this right away and advise you accordingly.

Are there any further observations?

Thank you all for coming in. It has been very helpful.

[The following questions were not asked at the hearing but were submitted to the Department for response subsequent to the hearing:]

SUBMITTED QUESTIONS

CONSOLIDATED SPACE OPERATIONS CENTER

Question: What is the policy agreement between the National Aeronautics and Space Administration and the Department of Defense (DOD) concerning DOD priority rights over Shuttle payloads?

Answer: The policy agreement between NASA and DOD concerning priority rights is the NASA/DOD Memorandum of Understanding on Management and Operation of the Space Transportation System, dated 27 Mar 1980. The applicable passage on priority rights states "The DOD will have priority in mission preparation and operations consistent with established national space policy. In the event DOD requirements conflict with other mission activity, the NASA Administrator will honor an official request from the Secretary of the Air Force or refer the matter to higher authority."

Question: Please identity those missions on which those rights would be exercised.

Answer: It is impossible to state a priori which missions would require exercise of the DOD priority. Each can have its own unique set of requirements which include: operational requirements forcing a launch, availability of previously scheduled DOD launch slots, and the time required to prepare the DOD payload for launch given the unplanned launch requirement. Each of these conditions is highly variable.

We will make every attempt to schedule adequate launch positions for our requirements without unduly restricting civil access to the Shuttle.

Question: Under the policy agreement, who has the authority to pre-empt civilian payloads?

Answer: The Secretary of the Air Force is the decision authority for exercise of DOD priority rights. The NASA Administrator may appeal to the President. All civil launch agreements contain a stipulation that the civil user understands he is subject to pre-emption by US national security missions and should plan for that contingency.

Question: Please provide for the record a copy of the 1977 agreements concerning DOD pre-emption of Shuttle missions which you referred to in your testimony.

Answer: Copy of the 1980 update to the 1977 Agreement provided for the record. Paragraph 2.1 is the applicable paragraph.

NASA/DOD MEMORANDUM OF UNDERSTANDING ON MANAGEMENT AND OPERATION OF THE SPACE TRANSPORTATION SYSTEM

1.0 PURPOSE: The National Aeronautics and Space Act of 1958 establishes roles and responsibilities for the NASA and the DOD with respect to aeronautics and space. Consistent with that act, this Memorandum of Understanding (MOU) defines the broad policies and principles that govern the relationship between the DOD and the NASA relative to the Space Transportation System (STS), and delineates their roles and responsibilities in its development, acquisition, and operation.

Elements of the Space Transportation System include the Space Shuttle, Shuttle-compatible upper stages, Spacelab, launch and landing facilities including associated ground support equipment, appropriate simulation and training facilities, and mission control facilities necessary for operation of the system. Detailed terms and conditions for the management and use of these elements will be included in sub-agreements to this MOU.

2.0 GENERAL POLICIES AND PRINCIPLES: The Space Transportation System (STS) is a national asset designed to serve both civil and defense users in a manner consistent with applicable space policy directives, statutes and executive orders. The NASA is responsible for overall management of the STS. The DOD, in conjunction with the designated office for other operations in space, is the agency within the U.S. government with the responsibility to represent national security interests in the STS and therefore is participating as a partner in its development, acquisition, and operations. The DOD has designated the Air Force as the sole point of contact with the NASA for all commitments affecting the STS and its use in matters regarding national security space operations and international defense activities covered by Government to Government agreements.

Effective and efficient conduct of the STS Program requires an environment of mutual support and cooperation between the two agencies. To this end, an effective interchange of essential technical, financial, and managerial information will be maintained. This interchange will be accomplished at all levels of the Air Force and the NASA. Coordination will be maintained through the Aeronautics and Astronautics Coordinating Board and other joint groups established by mutual agreement.

2.1 Initially, all STS flight operations will have to be directed from NASA-managed facilities at the Johnson Space Center (JSC). In order to ensure that the STS will have maximum national utility, the DOD will develop the capability and the facilities from which to plan and control national security missions. The NASA will assist in DOD preparation for transition to this facility by integrating DOD personnel into NASA line functions at JSC for training and operational experience.

During this initial period of operations, civil missions conducted in accordance with mission requirements of the civil community, and national security missions conducted in accordance with DOD mission requirements, will share a number of common facilities and other resources at JSC. The DOD will have priority in mission preparation and operations consistent with established national space policy. In the event DOD requirements conflict with other mission activity, the NASA Administrator will honor an official request for priority from the Secretary of the Air Force or refer the matter to higher authority.

2.2 Certain DOD missions operated out of JSC will, by agreement between the Secretary of Defense and the Administrator of the NASA, be specified as "Designated National Security Missions." Designated missions refer to individual missions selected from among those space activities peculiar to or primarily associated with national security programs, associated research and development activities, or space operations involving national security

objectives. These missions will be executed by DOD Mission Directors and Flight Directors through the Air Force chain of command. Individual missions may be so designated at any time consistent with necessary preparation and support. The point at which operational control will be vested in the Air Force will be identified in the joint designating document. For each mission so designated, the DOD and the NASA will develop a mutually agreed mission support plan which will define detailed roles, responsibilities and authorities of the two agencies. The NASA, in response to DOD mission requirements, will conduct other national security missions from JSC. The mission requirements and the necessary support for these missions will be integrated into overall STS planning and operations by the NASA, giving proper recognition to agreed mission priority, available resources, and crew and flight systems capabilities.

2.3 Specific detailed provisions for the period prior to operations in the dedicated DOD facility will be the subject of a sub-agreement to this MOU which will be consummated by the Director JSC and the USAF Commander Space Division.

3.0 ORGANIZATIONAL ROLES AND RESPONSIBILITIES: The effectiveness of the STS requires a cooperative and coordinated effort between the NASA and the DOD in systems development, acquisition and operations. Each agency, however, has a number of responsibilities in which, with the participation of the other, it has the dominant role. The two agencies agree to the following principal roles and responsibilities for management of development, acquisition, and operation of the STS.

3.1 NASA - ROLES AND RESPONSIBILITIES: The NASA has overall responsibility to develop, manage, provide systems engineering for, and operate the Shuttle-based STS to serve all authorized space users in accordance with established policies. In discharging this responsibility, the NASA will:

3.1.1 Develop and acquire the Space Shuttle, which includes the orbiter and its propulsion systems, the solid rocket boosters,

the external tank, system enhancements, common flight kits, flight software, and logistics support.

3.1.2 Acquire Spacelab elements, including pressurized module, pallets, instrument pointing system, software, and test and checkout equipment.

3.1.3 Ensure that the commercially-developed Spinning Solid Upper Stages (SSUSs) have adequate safety margins and are functionally compatible with Space Shuttle. The using agency will, under normal circumstances, procure SSUSs directly from the commercial source.

3.1.4 Provide and operate the facilities, general purpose equipment, software and spares required for all Space Shuttle mission planning, simulation, training, and flight operations at JSC; and for pre-launch, launch, landing, and ground turnaround activities for Space Shuttle operations at the Kennedy Space Center (KSC).

3.1.5 Provide requirements for Vandenberg operations for civil missions, and systems level support to VAFB activation. Fund unique NASA requirements.

3.1.6 Incorporate funded national security requirements in the development and operation of the STS with due consideration for schedule and cost impacts. Coordinate with the DOD any changes, such as design, performance, and schedule modifications, which could impact national security mission accomplishment.

3.1.7 Provide to the DOD the civil requirements for the Inertial Upper Stage (IUS), participate with the DOD during IUS development to ensure that these requirements are incorporated, use the IUS for appropriate missions, and fund for requirements which are peculiar to civil needs.

3.1.8 Carry out Shuttle flight planning, simulation, training, integration, and operations for all Shuttle flights when these activities take place at JSC, except as provided for in paragraph 3.1.9. National security missions conducted by the NASA will be responsive to DOD Mission Directors, with proper recognition given

to agreed mission priorities, available resources, and crew and flight system capabilities and safety. The DOD Mission Directors will retain overall responsibility for achieving mission objectives. The DOD personnel will be integrated into NASA line functions for training and to assist in carrying out these activities. The objective of this training is to allow the USAF to develop the capability to plan, control, and operate national security missions.

3.1.9 Support Designated National Security Missions in the manner and to the extent specified and agreed to by the Administrator of the NASA and the Secretary of Defense. For missions so designated, the Air Force will be responsible for overall mission accomplishment and operational control, including flight vehicle and crew safety, through the Air Force chain of command.

3.1.10 Develop, in coordination with the DOD, joint integrated logistics and training plans in support of STS operations. Implement these plans at JSC and KSC. Support implementation of these plans by the Air Force at VAFB.

3.1.11 Support the DOD in the planning, development and activation of a separate DOD facility for Shuttle mission planning, operations, and control.

3.2 DOD - ROLES AND RESPONSIBILITIES: The Department of Defense is responsible for the conduct of all national security missions through the designated DOD offices for the management of national security operations in space. Further, the DOD will develop and acquire specified elements of the STS and will ensure that other aspects of the STS program are consistent with national security requirements. On behalf of the DOD, the Air Force will:

3.2.1 Act as the sole point of contact with the NASA to ensure that the needs and priorities of the DOD and the other departments and agencies with functions related to national security are reflected adequately in the development, acquisition, and operation of the STS.

3.2.2 Provide the requirements and funds for unique facilities and equipment required for national security space operations, and ensure their compatibility with the STS.

3.2.3 Provide such procedures as needed to insure the proper interface between national security missions and the STS. For national security missions, this includes the development and implementation of operational support plans, overall security arrangements, public affairs policies, and contingency plans for emergencies. Where these activities affect NASA responsibilities or facilities, they shall be developed in coordination with the NASA.

3.2.4 Develop the expendable Inertial Upper Stage (IUS), including general purpose ground support equipment and checkout facilities. The Air Force will incorporate the NASA requirements into the IUS and manage the development of NASA funded unique IUS hardware and/or software.

3.2.5 Provide and operate the facilities, general purpose equipment, ground software, and ground spares to perform the prelaunch, launch, landing, and ground turnaround activities for all Space Shuttle operations at VAFB.

3.2.6 Support the NASA in developing joint integrated STS logistics and training plans for use at JSC, KSC, and VAFB. Implement these plans at VAFB.

3.2.7 Serve as the focal point for providing necessary data to the NASA for hardware and software integration for DOD payloads.

3.2.8 Provide a DOD Mission Director, for all national security missions controlled from JSC, who shall have overall responsibility for mission objectives and for providing requirements for the NASA activities in support of mission objectives. In addition, provide trained and qualified DOD Flight Directors for designated national security missions who will exercise operational command and control through the Air Force chain of command. Provide DOD personnel to be integrated into NASA line functions at JSC to develop the DOD's capability to carry out national security missions.

3.2.9 Develop, acquire, and operate a dedicated Shuttle mission planning, operations, and control facility for national security missions. This facility will be compatible with the NASA facilities and each will back up the other to the extent necessary to insure survivability and flight vehicle and crew safety.

3.3 OTHER RESPONSIBILITIES:

3.3.1 The resources of both agencies which can contribute to the development, test, production, training, and operations for the STS will be used to the maximum extent possible.

3.3.2 To the maximum extent practical, ground support equipment, software, and ground operating procedures developed for use at KSC by the NASA will be used by the DOD at VAFB. The NASA will acquire, maintain configuration control, and be reimbursed for common GSE and software used by the DOD at VAFB under mutually agreed financial arrangements. The NASA will consider the DOD operational requirements at VAFB in the development of KSC equipment and procedures to enhance commonality.

3.3.3 Unique payload processing facilities external to the launch pad will be provided by the using agency to support payload operations at each launch site. Where appropriate and feasible, mutual use of facilities and GSE will be planned.

3.3.4 Common STS flight elements will be interchangeable for use on either agency's missions, capable of being operated at all designated launch and landing sites, and compatible with the communications, command and control systems of both agencies. Exceptions to this provision, such as the absence of IUS capability at VAFB, may be reached by mutual agreement of both agencies.

3.3.5 Requirements for procurement and operation of STS elements will be developed by the respective using agency and transmitted in a timely manner to the agency responsible for their fulfillment.

3.3.6 An STS mission assignment schedule and plan, consistent with expendable booster transition and phaseout plans, will be

maintained by the NASA to provide the basis for program and operational analyses and planning by both agencies. The DOD will provide timely and appropriate formal inputs to this plan reflecting current mission requirements. Elements of this plan impacting DOD requirements or resources will be coordinated with the DOD prior to publication."

3.3.7 The DOD and the NASA will agree on implementation of the DOD requirements at NASA facilities. These provisions will be subject to negotiated reimbursement in accordance with paragraph 3.3.8.

3.3.8 The NASA is responsible for establishing STS pricing and reimbursement policy for all non-DOD users except for those elements developed by the DOD. Pricing and reimbursement policies between the NASA and the DOD will be jointly negotiated and set forth in separate sub-agreements to this MOU. These sub-agreements will specify those reimbursements which apply to standard missions and system capabilities and those which apply to the development or use of unique capabilities.

3.3.9 The DOD and the NASA will, in response to evolving national policy requirements, identify and implement necessary STS survivability modifications or enhancements.

4.0 SUB-AGREEMENTS: This MOU provides the basis for existing and future sub-agreements between the NASA and DOD organizations. These sub-agreements will further delineate STS development, acquisition, logistics, operations, training, and the related technical and financial roles and responsibilities for each agency. Sub-agreements may be added or deleted as mutually agreed upon by both agencies.

Delegation of approval authority within each agency will be established and authenticated at an organizational level no higher than that required to commit to all provisions called for in the sub-agreement. The pricing agreement of latest date between the NASA and the DOD concerning Space Transportation System Launch Reimbursements is a valid sub-agreement under this MOU.

5.0 AUTHENTICATION:

5.1 This Memorandum of Understanding represents the basic agreement between the NASA and the DOD for the development, acquisition, and operation of the Space Transportation System. Revisions and/or amendments will be made as required to maintain the currency of this document.

5.2 This Memorandum of Understanding is effective on the latest date of signature on the following page. It supersedes the NASA/DOD Memorandum of Understanding on Management and Operations of the Space Transportation System, dated January 14, 1977 and shall remain in effect until modified or terminated by mutual agreement of the two agencies.

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for Space Transportation
Systems

DATE: 25 Feb 1980

Hans Mark
HANS MARK
Secretary of the Air Force

DATE: Feb. 25, 1980

APPROVED:

Robert A. Frosch
ROBERT A. FROSCH
Administrator
National Aeronautics and
Space Administration

DATE: 25 Feb 1980

W. Graham Claytor Jr.
W. GRAHAM CLAYTOR, JR.
Deputy Secretary of Defense

DATE: MAR 27 1980

CONSOLIDATED SPACE OPERATIONS CENTER

QUESTION: You have stated that CSOC will conduct multi-security level Shuttle missions. Will you please identify what software will be used to perform such multi-level operations? If such software is not currently available, what is the estimated cost of its development? Is that cost within the estimated $1.4 billion total now given for the costs associated with CSOC?

ANSWER: The ability to conduct multi-level security operations is based on the overall architecture of the Shuttle Control system rather than the software. The bulk of CSOC Shuttle software will be direct adaptation of NASA's; however, the flight control rooms, computers and communications will be configured with security requirements considered during design. Within the CSOC, physical separation and shielding allows operation at whatever security environment is needed.

Data privacy between payloads (including multi-level security) is achieved by routing secure telemetry streams into individual mission control complexes. An important feature of CSOC will be the operational flexibility to generate the secure environment that is dictated by mission requirements. This capability is included in the CSOC funding projections.

QUESTION: Has the establishment of the Air Force's Space Command been approved by each of the Joint Chiefs of Staff?

ANSWER: No. The Space Command is a Major Command of the Air Force. As such, it is established at the direction of the Secretary of the Air Force with the cognizance of the Secretary of the Defense. If Space Command is to be designated a specified or unified command, approval of the Joint Chiefs of Staff would be required.

QUESTION: Would you please tell us if the Secretary of Defense intends to make this the Space Command for all of DOD, or will there be separate Army and Navy Space Commands?

ANSWER: Discussions regarding DOD space management organization are continuing. While no commitments have been made, designation of Space Command as a unified or specified command appears to be a logical evolutionary step.

QUESTION: Normal procurements in the Air Force follow a very logical pattern: definition of a mission need, approval of that mission, evaluation of alternative means of fulfilling the mission, the definition of a concept of operations, design, and finally, contracting for a system. Will you please indicate to this Subcommittee the dates on which these stages were accomplished for CSOC, and the exact status of the CSOC effort at this time?

ANSWER: Preliminary CSOC concepts were first documented in the Space Mission Control Studies in 1977. In Oct-Nov 1978, the Satellite Control Capabilities Steering Group conducted a joint OSD, NASA and Air Force review of satellite and Shuttle control planning and endorsed the consolidated control facility concept.

Alternative means of accomplishing the CSOC missions were addressed in a report for the Office of Management and Budget prepared in the summer of 1979. This report addressed various alternative configurations and locations for CSOC. Mission Element Need Statements for Satellite and DOD Shuttle Control Capabilities were validated by the Secretary of Defense in Sep 1979. The CSOC operations concept was published in June 1980 with a revision in June 1981.

The CSOC satellite control systems will be based on the Data System Modernization Project of the Air Force Satellite Control Facility. An 18 month competitive design phase was concluded in Dec 1980. The follow-on detailed design and acquisition contract includes CSOC options for hardware and software that can be exercised in late 1983 for delivery to CSOC in early 1985.

The CSOC Shuttle control systems will be based on NASA's Johnson Space Center. The acquisition plan is based on the maximum utilization of existing NASA software. A joint Air Force/NASA study was started in Feb 1982 to perform the design definition of the CSOC Shuttle control systems to be operating in the late 1980s. Preliminary results of this 15 month effort will be available this winter for engineering review. Contracting activities are scheduled to start in FY 83.

TRW was selected as the CSOC integrating contractor in June 1982. The next acquisition activity will be the communication segment; Request for Proposal release is scheduled for Sep 1982 with contract award in Apr 1983 and deliveries in early 1985. Award of the facilities construction contract is planned for the spring of 1983 with construction completion in mid 1985.

Question: Please provide a record of cost estimates as they were developed since CSOC was first considered.

Answer: The original CSOC cost estimates were derived from work done for the Satellite Test Center II and the Shuttle Operations and Planning Center. Successive CSOC cost projections have reflected the anticipated program start dates, construction phasing and the projected operational dates (IOC and FOC). A history of CSOC cost projections is shown below (TY $):

a. Jan 1980 - $450M (acquistion costs through FOC)
These costs are based on the August 1979 Report to OMB on Satellite and DOD Shuttle Control Capabilities which assumed an FY 81 program start, FY 82 MILCON, and an FY 85 IOC.

b. Jan 1981 - $900M (acquistion costs through FOC)
These costs are based on a 1980 Space Division CSOC Task Force Report with construction in FY 83 and IOC in 1986 and FOC in 1988. The Task Force conducted a rigorous program requirements review, developed the acquisition philosophy and and greatly refined costing assumptions used previously.

c. Jan 1982 - $1.2B (acquistion costs through FOC)
The FY 83 President's Budget includes phased MILCON program (FY 83/84) and achieves satellite control IOC in late 1986, shuttle control IOC in late 1987 and FOC in 1990.

QUESTION: In published information about CSOC, you state that the Tracking and Data Relay Satellite System (TDRSS) will provide the primary communications to the Shuttle. Will you please identify what portion of this MILCON request, or any other funding you are requesting during FY 1983, will be for providing TDRSS linkage or any other communications link for the CSOC?

ANSWER: There are no FY 83 MILCON funds associated with the planned links between CSOC and the TDRSS ground station at White Sands, New Mexico. These links, along with those to the Satellite Test Center, Johnson Space Center, SPADOC, and other control facilities will be provided as part of the CSOC communications segment. The FY 83 funding request includes $8M for development and acquisition of the communications segment.

QUESTION: GAO has stated that the ADCOM Space Defense Operations Center is a prime candidate for inclusion into the CSOC because of the likeness of functions and the fact that their computations could be done on the same computers. You have placed the Space Command under CINCADCOM because it was natural, economical and efficient. What is the basis of your reluctance to consider SPADOC for inclusion in the CSOC as recommended by GAO?

ANSWER: There has been no reluctance to consider SPADOC for inclusion in the CSOC. Air Force has examined the relationships between SPADOC and CSOC and has found that the mission requirements of each argue against consolidation/collocation. There is a fundamental distinction between the military command, control and communications functions of SPADOC and the tracking, telemetry and commanding of on-orbit space vehicles by CSOC. SPADOC's mission is to perform space surviellance, correlate indications and warning data on hostile foreign space systems and conduct space defense operations. SPADOC is an integral part of CINCAD's command and control structure within Cheyenne Mountain.

CSOC's mission is to accomplish mission planning, command generation, command upload, and to maintain health and status of orbiting spacecraft and to conduct planning, readiness and on-orbit operations for DOD Shuttle missions. CSOC's functions are integrally related to the spacecraft it services and requires extensive computational capability uniquely designed to satisfy the mission needs of those spacecraft. The Air Force believes that construcion of SPADOC, a command control element, separately from CSOC, an on-orbit operations support element, is appropriate.

QUESTION: The Department of Defense states that the CSOC is only to provide generic services to the different satellite owners. Will you please indicate exactly how the different requirements have been established and who in DOD validated them for incorporation into the CSOC?

ANSWER: The generic services to be provided by the CSOC are inherent in the CSOC mission. The CSOC concept was validated by the OSD chartered and chaired Satellite Control Capabilities Steering Group in Nov 1978. The Mission Element Need Statements were validated by the Secretary of Defense in Sep 1979.

Specific satellite support requirements are documented in the Orbital Requirements Documents prepared by the program offices. The CSOC operations concepts and individual program assignments have not been subject to specific DOD validation. These are within the purview of the Air Force.

QUESTION: You have stated that the "computer family selected for the new satellite control architecture was the result of an 18 month competitive design effort with three contractors participating." Please identify for this committee the names of the three competing contractors and the name of the vendor of the computers selected.

ANSWER: The three competing contractors were Hughes Aircraft Company, Space & Communications Group, El Segundo, CA; The Boeing Aerospace Company, Seattle, Washington; and International Business Machines (IBM) Corporation, Federal Systems Division, Gaithersburg, MD. The mainframe computers proposed by each contractor were as follows:

COMPANY	SERIES	MODELS
IBM	IBM 370	4341, 3033, & Series 1
HUGHES	IBM 370	4341, 3033, & Series 1
BOEING	CDC 170	750

These computers were the most current technology available at the time the bids were made. The size and number of computer mainframes proposed was a function of the system architecture proposed by each of the competitors. One design criteria was to provide growth capacity of at least 50% in the computational capability.

Since the selection of IBM in Dec 1980, IBM has announced the release of new models in the 370 family. The Air Force is currently negotiating the replacement of 3033s with the more capable 3083. This contract modification would also apply to options to equip the satellite control portion of CSOC.

QUESTION: Your Definition and Requirements document for CSOC says "one method of ensuring commonality, while facilitating verification testing and configuration control is to duplicate the JSC and STC hardware and software and procedures at the CSOC." That same document also talks about the obsolescence of Johnson Space Center computers and the fact that they must be upgraded. Will you please provide information on the status of the Johnson upgrade?

ANSWER: The following information was provided by NASA in response to the question:

"NASA has no firm plans to upgrade the JSC computers. Although their computers have been in service for several years NASA does not consider them out of date. They are aware of the problems which arise in the areas of maintenance repair parts and maintenance personnel availability as computers become obsolete. However, NASA states that they have not experienced any difficulties in maintaining their own system in the past and have not encountered anything in their planning which would indicate a problem in the immediate future. JSC personnel have indicated that a requirement for major computers upgrade could occur in the FY 85-FY 90 time frame at the earliest."

An upgrade of the JSC shuttle control systems would take advantage of the joint NASA/Air Force System Definition Study that is underway to identify the most cost effective means of acquiring the Air Force shuttle operations capability at CSOC.

NASA referenced this study in their response to the GAO report on CSOC (attached). NASA cites incomplete and inaccurate information used by the GAO and provides additional information so that the misleading impression given Congress and the scientific community by the GAO report can be corrected.

NASA
National Aeronautics and
Space Administration

Washington, D.C.
20546

JUL 22 1982

Honorable Charles A. Bowsher
Comptroller General of the
United States
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Bowsher:

The GAO report, "Consolidated Space Operations Center Lacks Adequate DOD Planning," MASAD 84-14 dated January 29, 1982, includes several statements which inaccurately represent NASA plans and capabilities relative to the use of data processing systems for Space Shuttle operations support. Of even greater importance is the overall GAO position that the NASA Mission Control Center computer hardware and software are outmoded and that the Air Force is planning to use the same equipment and software in their own facility. These conclusions represent a substantial misunderstanding of what is being planned. The information used by GAO in arriving at their position is both incomplete and inaccurate, and as a result, both the Congress and the scientific community have been seriously misled.

At the Air Force's request, NASA is conducting a 15-month, $10 million System Definition Study to identify the most cost-effective methods for the Air Force to acquire a Shuttle operations capability as quickly and as economically as possible, while assuring that when this capability is in operation both the NASA JSC Mission Control Center and the USAF SOPC can serve as fully-functional backup for each other.

Of paramount importance is the fact that the Air Force will not be restrained in their selection of hardware. The System Definition Study will establish a baseline which will describe the minimum host hardware capability needed. The Air Force will have the option of choosing any technology level they feel is necessary to meet their needs. Since the Air Force has not yet made their choice, it is difficult to see how GAO can say that they are acquiring outmoded capability.

However, as part of this process we do intend to make maximum use of the existing software which we have developed at a cost of almost $420 million. We believe that this is the most sensible and prudent course to follow in view of the fact that in recent years the development of new software has become the most costly element in the procurement of any new data processing capability.

The specific examples cited by GAO to support their conclusions are discussed in more detail below:

GAO STATEMENT: "JSC upgrade anticipates at least 10 IBM 3033s."
"The IBM 3033s were developed about 1977, and if CSOC reaches its scheduled Initial Operating Capability by 1987, they will be 10 years old. They have already been pronounced obsolete, being replaced by the IBM 3081 computers. This raises serious questions about maintenance repair parts and maintenance personnel availability in 1987."

NASA COMMENT: This segment of the report is inaccurate in two ways. In the first place the report implies that the 3033 systems are in the Mission Control Center when, in fact, they are not. They have never been a part of

the Mission Control Center and we do not plan to install any of them there. In addition, the statement that we are buying 10 IBM 3033 systems is not correct. Our existing contract with IBM calls for the phased acquisition of three IBM 3033s rather than the 10 cited in the report. These systems are to be placed in our Software Production Facility, which is used to generate the Orbiter onboard software loads. One 3033 system has been delivered, one is scheduled later this year, and another two years later. At the present time we are negotiating with IBM to explore the feasibility of substituting a newer 3083 system for the third 3033.

We agree with GAO that the IBM 3081 systems are more powerful than the 3033-type systems, but at the time we began this procurement we did not choose the 3081s because IBM did not offer them. This occurred because our specifications called for a multiple-system capability using several smaller systems which could be used as backup for each other, as well as accommodate simultaneous secure and non-secure processing. This technology is fully capable of meeting current mission requirements, and as these requirements change, the use of smaller, multiple systems will allow us to take advantage of new technology without undue cost or loss of the software capability already developed.

We have not experienced any difficulty in maintaining our own systems in the past, and we have not encountered anything in our planning which would indicate that there will be a problem in the future.

GAO STATEMENT: "In addition to being old, these business type processors (scalar) are not the scientific type of computers (vector) that are more efficient for complex satellite orbit computations. If a normal automatic data processing development cycle had been followed, the advantages of more capable scientific computers probably could have been considered."

NASA COMMENT: Complex space vehicle orbit computations make up a relatively small percentage of the total processing performed by JSC mission support computers. If complex vector processing were a significant requirement in this environment, the existing system 370 computers in the Mission Control Center could have been readily augmented with the attachment of standard IBM vector processing subsystems.

Further, as previously discussed, our choice of 3033 systems has nothing to do with which system the Air Force does or does not choose to install.

GAO STATEMENT: "Besides modern hardware, new developments in software technology have not been recognized. The replication of SCF hardware and software may be the least expensive short-run option available. In the long run, however, the increasing difficulty with maintaining old software may offset any savings. We have noted that SOC and SOPC are written in older languages, Jovial and Fortran. The Air Force intends to replicate the JSC software and rewrite the upgraded SCF system in Jovial J-73. In this regard, DOD is currently standardizing on a new high level language called Ada. This state-of-the-art language is intended to replace the older Jovial and provide more cost-effective software development and maintenance capability. While we have not fully reviewed the DSM program, we believe that converting the programs to Jovial J-73 then having to convert into the DOD standard Ada language is not a cost-effective approach."

NASA COMMENT: GAO's implication that software maintenance will be more efficient if reprogrammed into the newer language has no basis in fact. As previously stated, the System Definition Study does not mandate that the Air Force duplicate the data processing hardware existing at JSC. Most of the $420 million software investment currently executes on IBM and UNIVAC computers. This software is upward compatible with newer IBM and UNIVAC computers so the Air Force is free to procure newer computer systems.

A certain amount of reprogramming and restructuring of data files is always needed when new host computers are being considered. However, the costs of these activities are not significant when it is considered that the Air Force will not be required to make any investment in the development of the software,

and their maintenance costs will be limited to the amount required for software development unique to the SOPC.

In addition, the replication will result in a savings by preserving the commonality of software needed to enhance the mutual backup capability of the two Centers thereby saving most of the $420 million already invested.

We are furnishing this information for your use in correcting the misinformation given to the Congress. We recommend that NASA be afforded the opportunity to comment on future reports concerning NASA activities before they are published, especially when significant issues are involved, to guard against a recurrence of this type of situation.

Sincerely,

Walter B. Olstad

Walter B. Olstad
Associate Administrator
for Management

CONSOLIDATED SPACE OPERATIONS CENTER

QUESTION: It has been stated that the Air Force plans to replicate JSC and SCF software in the CSOC to save software development costs. Will you please tell us why the CSOC needs a $17.3 million "Software Development Test Lab", when NORAD has one in their Off Site Test Facility (OSTF)?

ANSWER: The COSC System Development Test Laboratory (SDTL) will have both an operational role as well as development/test functions. The SDTL will be configured as a satellite mission control complex rather than just a computer facility. Initially the SDTL will provide provide a minimum essential backup capability for the Satellite Test Test Center (STC) prior to CSOC IOC. Post IOC, the SDTL will be assigned to contingency mission operations if the STC is degraded or disabled.

The routine day-to-day functions of the SDTL invlove support of ongoing software development and maintenance, system training and operational readiness activities. These offline functions of the SDTL allow the mission control complex resources to focus on real time operations support.

The NORAD OSTF is dedicated to support software development and maintenance requirements of the NORAD Cheyenne Mountain Complex (NCMC). It uses computers and software unique to the NCMC that are different than those planned for CSOC. The OSTF mainframes are built by Honeywell while satellite and Shuttle control systems will use IBM mainframes. The OSTF architecture and language is not compatible with the Satellite and the Shuttle control systems. More importantly, the missions of the NCMC and the CSOC are fundamentally different as are the functions of the OSTF and The SDTL.

QUESTION: Your budget figures for the CSOC indicate $152 million for simulators at the center. We assume that this is for the Shuttle flight controls and for the payload and arm controls. These currently are one-of-a-kind set of software programs operating on ten Univac 1100 series computers at JSC. Do you plan to replicate these older computers as well?

ANSWER: NASA/Johnson Space Center uses eight 1100 series Univac computers to host the Fixed Base Crew Station (FBCS) and the Motion Base Crew Station (MBCS) simulators. CSOC requirements identify a need for a FBCS only; the computational capacity equivalent to four 1100 series Univacs is planned for the CSOC site. Selection of the computers has not yet beem made.

A design definition study of the CSOC Shuttle Operations and Planning Complex is underway. This study will be completed in the summer of 1983 and will address computer mainframes including those needed for FBCS host computers. An objective of that study is to identify the most cost effective computers that are compatible with existing software.

QUESTION: You have indicated that the CSOC is designed to be both a SOPC and a SOC center. Will you please identify for us the funding necessary to:

a. building only the SOC portion at this time.

b. consolidate the two into one center as GAO suggests.

c. incorporate GPS, DMSP and SPADOC as GAO suggests.

ANSWER: The development of high confidence cost estimates of the type requested require both time and commitment of significant personnel resources. The data provided below is a qualitative assessment of the costs involved.

a. The Satellite Operations Complex (SOC) costs, based on a pro rata share of the planned CSOC program would be on the order of $425M. This includes $95M MILCON. The operational impact of a program restructure at this time would be at least a one year delay. The programmatic cost increases to add SOPC later have not been addressed but the cost would certainly be greater than the consolidated approach now underway.

b. Consolidation of SOC and SOPC into a new integrated data system was considered during the 1980 CSOC Task Force Study. The investment required to recover existing software into the new system was prohibitive and this approach was not pursued further. The software industry standard of $150 per line of source code for conversion, test and documentation was considered. The transition of 6 million lines of existing Shuttle control code and 3 million lines of satellite control code led to a rough estimate of $1.3B for software alone. This integrated approach would also give up the direct interoperability of CSOC between Johnson Space Center and the Satellite Test Center for Shuttle and satellite control respectively.

c. The GAO suggestion to integrate GPS, DMSP and SPADOC into the CSOC (beyond the GPS collocation already planned) does not appreciate the differing maturity for these programs. The GPS control segment development has been underway since Sep 80 under a fixed price contract of $150M. Inclusion of GPS into the "integrated" CSOC would require major revision or cancellation of the existing contract and incur cost and schedule impacts and delay meeting GPS need dates.

The DMSP operational control is performed by the 4000th Satellite Operations Group at Offutt AFB, NE. DMSP is an established, operational program. A ground system upgrade is underway to support the Block 5D2 satellites. The recent investment in this upgrade would be lost and additional translation costs incurred if DMSP were to be added as a CSOC module.

The SPADOC preliminary design contract is currently under competition. As a new development, there would be no translation costs involved; additional integration effort would be necessary in the CSOC data system. This approach is operationally undesirable.

The Air Force is aware of the limitations that are incurred through separate development activities for each satellite program. The operational needs could be better served if development and acquisition were undertaken under the cognizance of an overall plan. Toward that end, the Air Force in 1981 developed a Satellite Control Plan that addressed the overall integration/interoperability of existing satellite control resources and the planning to achieve the most operational capability from future investments. The planning objectives have been promulgated as Air Force Policy.

Question: The FY 1983 Authorization for NASA included language to the effect that the Department of Defense would have to start paying for the full cost of putting its payloads in orbit. A reduction of $409 million was made in the 1983 budget for DOD support. Will you please tell us where in your space plans you consider this increased cost of using the Shuttle?

Answer: We understand that such language was placed in the NASA bill. We disagree with the wording "start paying" since we have and will continue to pay our fair share of the Space Shuttle program. Further, we see no connection between the concept of full cost and the figure $409M whose origin is unknown.

Our space plans for 1983 have been presented to the Congress in testimony. Our planning does not consider the $409M "increased cost" as it was proposed after our FY 83 program was presented to Congress for consideration. In general, our comments on the $409M

proposal are that it is inconsistent with with the Administration position, not in accordance with the established agreement on DOD payments for Shuttle flights, and sets a damaging precedent for future Shuttle use.

Question: We understand that funds are being spent at Vandenberg, Kennedy, Goddard, Johnson, and Sunnyvale to enhance Controlled Mode operations. Will you please identify how much is being requested in either MILCON or other funding this year for that purpose at each site?

Answer: The following development and acquisition funds have been requested in FY 83 for security upgrades at the sites indicated:

Vandenberg AF	Ø
Kennedy Space Center	34.7M
Goddard Space Flight Center	9.4M
Johnson Space Center	26.2M
Sunnyvale AFS	Ø

QUESTION: This year the Deputy Under Secretary of Defense for Command, Control, Communications and Intelligence listed space programs for which funds are requested: MILSTAR, DSCS III, FLTSATCOM, DMSP, GPS, IONDS, and a laser communications system. The FY 1983 request was for $8.5 billion. Will you please tell us how much of that was requested for Military Construction Funds to provide facilities for the programs, and how much of that total could have been saved by consolidating them into the CSOC?

ANSWER: MILCON funds requested provide facilities associated with mission applications rather than satellite control. The FY 83 MILCON request includes $6.8M for DSCS earth terminals and $1.9M for the Main Operating Base to support DSP Mobile Ground Terminal operations.

There are no savings possible through consolidation of these facilities into CSOC; their functions and necessary locations are unrelated to CSOC. It should be noted, however, that the Air Force is planning to locate the GPS Master Control Station in CSOC.

QUESTION: You have indicated a cost of $40.1 million through 1988 for the Mission Control Complex for the SOC. We understand that there has been a reduction from four to one of these centers to keep the cost of the COSC down. Will you indicate how many centers are contemplated in the $40.1 million request, and what the schedule will be for inclusion of additional centers in the future?

ANSWER: The CSOC Satellite Operation Complex will include four mission control complexes, a range control center, a software development test lab and facility space for the GPS Master Control Station (the MCS will be equipped with the GPS program developed control system rather than the integrated system proposed by GAO). When new missions evolve that cannot be accomodated in the planned growth capacity of the CSOC, the modular architecture will allow the addition of more satellite or shuttle control capability.

AIR FORCE PLANNING FOR CSOC

Two documents have been submitted to the Subcommittee that illustrate the overall Air Force planning for CSOC. The first is an annotated briefing on the Air Force Satellite Control Plan. This briefing, classified SECRET, places CSOC in the context of an integrated space operations network. This plan was the basis of Air Force policy regarding evolution of our space control systems

that was issued in Mar 1982. It should be noted that implementation of individual components of the plan are being addressed in the Air Force FY 84 POM.

The second document addresses the implementation of the CSOC program directly. This CSOC Program Management Plan illustrates the interface and relationship of the various aspects of the CSOC program.

SUBMITTED BRIEFINGS

The briefing on Space Transportation System which was to be presented by Maj Link is attached for inclusion in the transcript.

GOOD MORNING SENATOR LAXALT, MEMBERS OF THE COMMITTEE. IT IS A PLEASURE TO APPEAR BEFORE THIS COMMITTEE TODAY TO EXPLAIN TO YOU THE AIR FORCE REQUEST FOR FUNDS TO CONTINUE CONSTRUCTION IN SUPPORT OF THE DOD PORTION OF THE SPACE TRANSPORTATION SYSTEM. BEFORE I EXPLAIN THE DETAILS OF THIS YEAR'S REQUEST, I WOULD LIKE TO SUMMARIZE OUR EFFORTS TO DATE.

* 1. THIS SLIDE SHOWS THE AMOUNT THAT WE EXPECT TO EXPEND THROUGH FISCAL YEAR 1986 FOR CONSTRUCTION. THUS FAR THE CONGRESS HAS APPROPRIATED $405.5 MILLION BEGINNING IN FY 1979. THIS AMOUNT INCLUDES $87.6 MILLION THAT THE AF FOUND NECESSARY TO REPROGRAM FROM OTHER RESOURCES INTO THE LAUNCH COMPLEX AND THE ORBITER PROCESSING FACILITIES. THE COMMITTEES APPROVED THOSE REPROGRAMMING REQUESTS IN FY 1980 AND 81.

WE BEGAN CONSRTRUCTION IN 1979 ON THE FIRST PHASE OF THE LAUNCH COMPLEX AND HAVE BEEN MAKING CONTINUOUS PROGRESS EVER SINCE. AS OF TODAY, ALL OF THE CONSRUCTION APPROVED BY THE CONGRESS HAS BEEN PLACED UNDER CONTRACT EXCEPT FOR THREE PROJECTS. TWO OF THEM WILL BE ADVERTISED NEXT MONTH, AND I WILL ADDRESS THE THIRD ONE ON MY LAST SLIDE. WE CURRENTLY ESTIMATE THAT THE CONSTRUCTION EFFORT AUTHORIZED AND FUNDED TO DATE IS ABOUT 65% COMPLETE.

* 2. THIS NEXT SLIDE SHOWS THE COMPOSITION OF THE $82.2 MILLION THE AIR FORCE IS REQUESTING IN THIS YEAR'S BUDGET FOR THE STS CONSTRUCTION WHICH I WILL EXPLAIN ON THE NEXT THREE SLIDES.

* 3. THE FIRST LINE BUDGETS $40 MILLION FOR CONSTRUCTION OF A VERTICAL ASSEMBLY ENVIRONMENTAL SHELTER SHOWN IN THIS ARTISTS CONCEPTION OF THE LAUNCH COMPLEX. THE MARCH 1978 BASELINE FEATURED THE USE OF A HINGED MECHANISM FASTENED TO THE PCR - A TRACK - MOUNTED FACILITY - WHICH WOULD BE USED TO TRANSLATE THE ORBITER FROM ITS HORIZONTAL POSITION TO A VERTICAL POSITION & CONNECT IT TO THE EXTERNAL TANK. AS WE PROCEDED WITH DESIGN OF THAT CONCEPT, NASA WAS APPROACHING THE FIRST SHUTTLE FLIGHT & MATED THE ORBITER TO THE EXTERNAL TANK FOR THE FIRST TIME. THAT IS WHEN NASA TECHNICIANS REALIZED THAT THE TOLERANCE WITHIN THE

BALL & SOCKET COUPLING JOINTS BETWEEN THE TANK & THE ORBITER WERE LESS THAN PREDICTED - THEY WENT FROM 1/4" TO 1/16" & 1/32". THESE REDUCED TOLERANCES COUPLED WITH A WEIGHT INCREASE NECESSARY TO ATTAIN SUFFICIENT RIGIDITY IN THE HINGED MECHANISM DICTATED THAT THE ASSEMBLY OPERATION MUST TAKE PLACE IN AN ENCLOSED AREA. AT THAT POINT, THE PROGRAM MANAGER ACCEPTED THE SHELTER CONCEPT. THE SHELTER IS BEING DESIGNED SO THAT AS IT ROLLS FOWARD TO THE LAUNCH MOUNT, THE MST ROLLS OUT TO THE LAUNCH MOUNT AND TOGETHER THEY FORM A PROTECTIVE BARRIER ALL AROUND THE VEHICLE. EACH STRUCTURE HOUSES A BRIDGE CRANE. THESE CRANES ARE USED IN CONJUNCTION WITH EACH OTHER TO LIFT THE ORBITER TO ITS VERTICAL POSITION FOR ASSEMBLY. THIS CONCEPT ALLOWS THE USE OF NASA TESTED PORCEDURES AND SUPPORT EQUIPMENT, IMPROVES LAUNCH PAD OPERATIONS AND REDUCES PROCESSING TIME AND MANPOWER.

* 4. THE SECOND LINE OF OUR REQUEST PROVIDES AUTHORITY AND FUNDS TO MODIFY THE LAUNCH PAD FACILITIES AND ANY OTHER FACILITIES JUST CONSTRUCTED TO ACCOMODATE SUPPORT EQUIPMENT, VEHICLE OR BOOSTER CHANGES AND OPERATIONAL AND PROCEDURAL CHANGES THAT MAY OCCUR. IT ALSO ALLOWS US TO COMPLETE ITEMS OF WORK PREVIOUSLY IDENTIFIED, BUT UNDEFINED, ITEMS OF WORK THAT WE HAD CLASSIFIED AS "KNOWN CHANGES".

* 5. FINALLY, WE HAVE JUST COMPLETED AN EXHAUSTIVE SECURITY STUDY OF KENNEDY SPACE CENTER FROM WHERE WE WILL BE LAUNCHING DOD PAYLOADS ON BOARD NASA FLIGHTS. THAT STUDY POINTED OUT THE NEED TO PROVIDE SECURITY MEASURES IN THE DOD FIRING ROOM IN THE LAUNCH CONTROL CENTER AND TO PROTECT THE AUTOMATIC DATA PROCESSING SYSTEMS THAT WILL BE USED TO COMMUNICATE WITH THE PAYLOADS DURING PROCRESSING, LAUNCH AND DEPLOYMENT. WE WILL ALSO NEED TO PROVIDE PHYSICAL SECURITY AND CLASSIFIED STORAGE AREAS AS WELL AS REPLACEMENT SPACE FOR DISPLACED NASA FUNCTIONS. THAT COMPLETES THE DETAILS OF THIS YEAR'S BUDGET, BUT THERE HAS BEEN A CHANGE SINCE IT WAS SUBMITTED WHICH I WILL EXPLAIN ON THIS LAST SLIDE.

* 6. THIS SLIDE DEPICTS A "ZERO BALANCE" ADJUSTMENT WHICH CAME

ABOUT AFTER THE AIR FORCE BUDGET HAD BEEN SUBMITTED AND, WE FEEL THAT IT IS NECESSARY TO BRING THE MATTER TO THE ATTENTION OF THE COMMITTEE. AS YOU CAN SEE FROM THE TWO SETS OF COSTS, THE ESTIMATE FOR THE SHELTER STAYS THE SAME, BUT THE ESTIMATES FOR THE FACILITY MODS AND THE KSC SECURITY MODS HAVE BEEN REDUCED. WE WERE ABLE TO REDUCE THE SECURITY LINE AS A RESULT OF THE STUDY THAT I JUST MENTIONED. ALSO, IN MARCH OF THIS YEAR THE COMMITTEES APPROVED OUR REQUEST TO REPROGRAM $17.4 MILLION FROM THE SRB DISASSEMBLY FACILITY AT PT. HUENEME, CALIFORNIA WHICH WAS APPROPRIATED LAST YEAR. WE USED THESE FUNDS TO MAKE SOME RATHER URGENT CHANGES ON THE LAUNCH PAD. THE APPROVAL OF THAT REQUEST ALLOWED US TO REDUCE OUR FY83 BUDGET FOR ADDITIONAL WORK REQUIRED ON THE LAUNCH PAD TO THE $14.8 MILLION DISPLAYED HERE. THE COMBINATION OF THE TWO REDUCTIONS ALLOWS US TO BUDGET $18.3 MILLION FOR THE PT. HUENEME FACILITY AS PART OF THIS REQUEST. AS YOU CAN SEE, THE AMOUNT BUDGETED REMAINS THE SAME, BUT IN THE ADJUSTMENT WE CAN NOW PROCEED WITH CONSTRUCTION OF THE PT. HUENEME FACILITY DURING FISCAL 83. WE URGE YOU TO CONSIDER & APPROVE THIS ADJUSTMENT.

GENTLEMEN, THAT CONCLUDES THE BRIEFING. IF THERE ARE NO FURTHER QUESTIONS, I WOULD LIKE TO AGAIN THANK YOU FOR THE OPPURTUNITY TO APPEAR BEFORE THIS COMMITTEE.

SPACE TRANSPORTATION SYSTEM

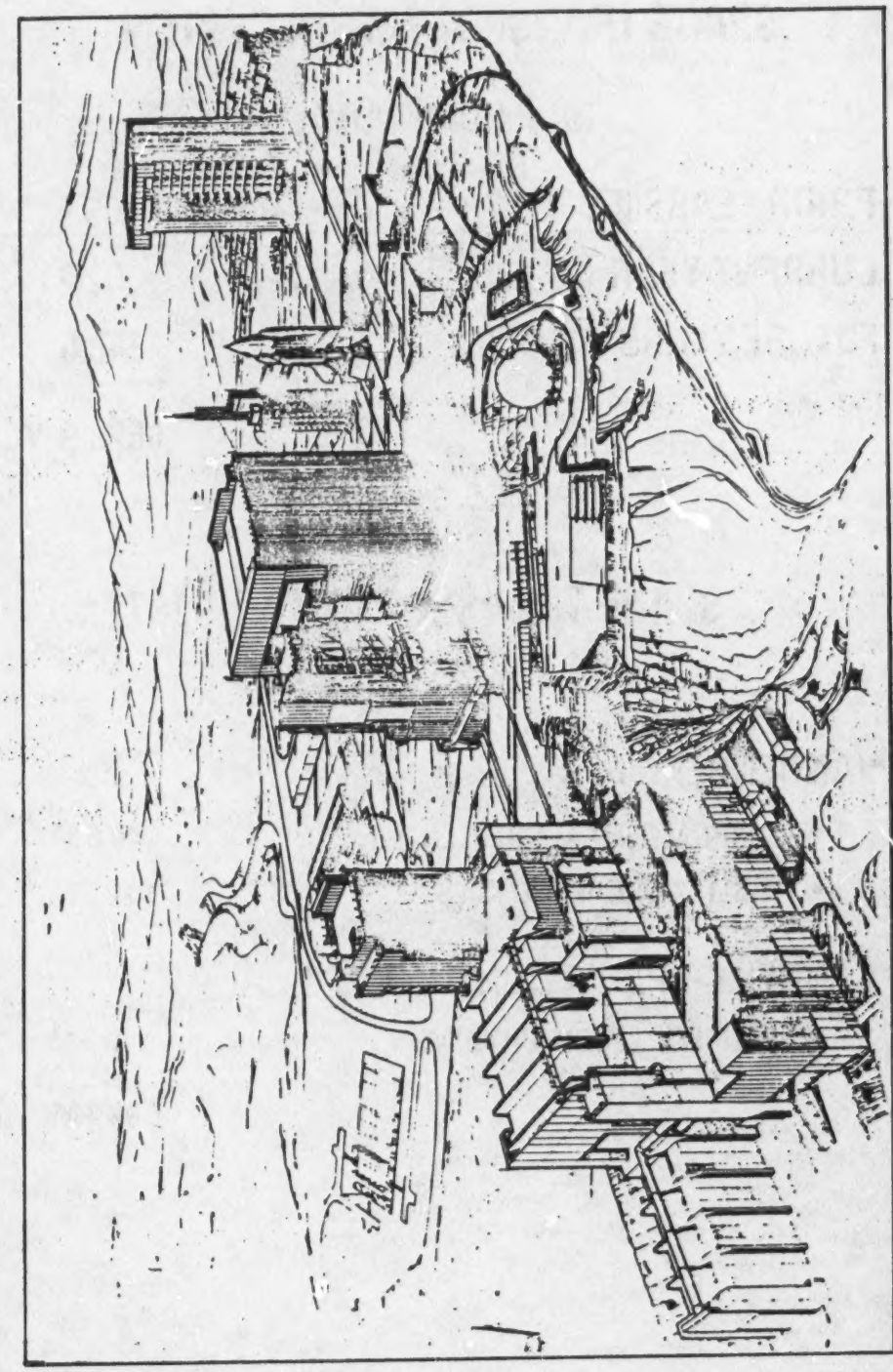
MCP SUMMARY

PRIOR YEARS (FY 79-82)	$405.5
CURRENT YEAR (FY 83)	82.2
FUTURE YEARS (FY 84-86)	140.5
TOTAL	$628.3 M

SPACE TRANSPORTATION SYSTEM

FY 83 REQUEST

• VANDENBERG AFB	
• ENVIRONMENTAL SHELTER	$ 40.0 M
• FACILITY MODIFICATIONS	$ 26.5 M
• KENNEDY SPACEFLIGHT CENTER	
• SECURITY MODIFICATIONS	$ 15.7 M
	$ 82.2 M



SPACE TRANSPORTATION SYSTEM

FY 83 MCP

- ADDITIONAL LAUNCH PAD MODIFICATIONS
  - COMPLETION OF KNOWN CHANGES
  - SUPPORT EQUIPMENT INSTALLATION
- VARIOUS FACILITY MODIFICATIONS
  - SUPPORT EQUIPMENT INSTALLATION
  - OPERATIONAL CHANGES
  - PROCEDURAL CHANGES

SPACE TRANSPORTATION SYSTEM
KSC SECURITY MODIFICATIONS

FY 83 MCP

- REQUIREMENT
  - REVISED SECURITY CLASSIFICATION GUIDE
  - PROTECT PAYLOAD & MISSION PECULIAR DATA
- SCOPE
  - EIGHT SEPARATE COMPUTER SYSTEMS PLUS REMOTE TERMINALS
  - TWELVE DIFFERENT FACILITIES IMPACTED
- PROTECTION METHODS
  - AREA CONTROL (PERIMETER CONTROL ZONES)
  - VISUAL & ACOUSTIC SECURITY
  - TEMPEST
  - CLASSIFIED STORAGE

SPACE TRANSPORTATION SYSTEM

FY 83 REQUEST/ADJUSTMENT

	$M
• A.F. REQUEST	
• VANDENBERG, ENVIRONMENTAL SHELTER	40.0
• VANDENBERG, FACILITY MODS	26.5
• KENNEDY S.C., SECURITY MODS	15.7
TOTAL	82.2
• "ZERO" BALANCE ADJUSTMENT	
• VANDENBERG, ENVIRONMENTAL SHELTER	40.0
• VANDENBERG, FACILITY MODS	14.8
• KENNEDY S.C., SECURITY MODS	9.1
• PT. HUENEME, SRB DISASSEMBLY FAC	18.3
TOTAL	82.2

THE BRIEFING ON THE AEROPROPULSION SYSTEMS TEST FACILITY WHICH WAS TO BE PRESENTED BY MAJ. LINK IS ATTACHED FOR INCLUSION IN THE TRANSCRIPT.

MR. LAXAULT, MEMBERS OF THE COMMITTEE. I AM PLEASED TO ONCE AGAIN HAVE THE OPPORTUNITY TO ADDRESS THIS COMMITTEE AND TO EXPLAIN THE DETAILS OF THE AIR FORCE REQUEST FOR $42 MILLION TO COMPLETE THE CONSTRUCTION OF THE AREOPROPULSION SYSTEMS TEST FACILITY - BETTER KNOWN AS ASTF. THIS PHOTOGRAPH TAKEN IN APRIL SHOWS THE EXTENT OF CONSTRUCTION TO DATE. I WILL FIRST PROVIDE A SYNOPSIS OF OUR FUNDING PROFILE, THEN PROVIDE AN EXPLANATION OF THIS YEARS REQUEST AND FINALLY DISCUSS THE MAJOR MILESTONES BETWEEN OUR CURRENT PROGRESS AND PROJECT COMPLETION.

1. THIS FIRST SLIDE DEPICTS OUR ESTIMATE TO COMPLETION. WE PRESENTED THAT ESTIMATE TO THE CONGRESS OVER ONE YEAR AGO, AND WE STILL ESTIMATE THAT WE WILL COMPLETE THE PROJECT WITHIN THAT AMOUNT. WE HAVE RECEIVED THE APPROVAL FOR OUR FY82 REPROGRAMMING ACITONS AND HAVE PASSED THOSE FUNDS ON TO OUR AF AND COE MANAGERS IN THE FIELD. THE CORPS HAS RECENTLY BEGUN NEGOTIATIONS WITH THE CONSTRUCTION CONTRACTOR ON SOME RATHER SIGNIFICANT CHANGES AS WELL AS SETTLEMENT OF THE FINAL COMPLETION DATE. OUR AIR FORCE MANAGER HAS BEEN ABLE TO PROCEED WITH PROCUREMENT OF THE TEST INSTRUMENTATION SYSTEM AND THE AUTOMATIC TEST CONTROL SYSTEM AS WELL AS EXERCISE HIS OPTIONS FOR THE REMAINDER OF THE FY TO EXTEND PLANT AND EQUIPMENT REPRESENTATIVES AND THE TECHNICAL EXPERTISE THAT HE NEEDS TO ASSUME PROPER INTEGRATION AND TESTING OF ALL OF THE SYSTEMS BEING INSTALLED.

I WOULD LIKE TO BRING TO YOUR ATTENTION THAT THE CATAGORIES LISTED ON THIS SLIDE REPRESENT EXTENSION OF THOSE PROGRAM AREAS PREVIOUSLY APPROVED AND PARTIALLY FUNDED. THERE ARE NO NEW STARTS REPRESENTED IN THIS YEAR'S REQUEST. SINCE OUR CASH FLOW REQUIREMENTS WILL EXTEND THROUGH MOST OF 1984 WHICH IS OUR FORECASTED COMPLETION DATE, IT WAS NOT NECESSARY TO SEEK FULL

FUNDING LAST YEAR. OUR REPROGRAMMING REQUESTS WERE BASED ON THE AMOUNT WE NEEDED TO KEEP THE PROJECT MOVING UNTIL WE REACHED THE NEXT FUNDING PHASE POINT. OUR REQUEST FOR $42 MILLION REPRESENTS OUR FINAL REQUIREMENT FOR FUNDS.

3. THIS FINAL SLIDE TAKES YOU THROUGH THE MAJOR MILESTONES THAT WE SEE BEFORE US AS WE MOVE TO CONSTRUCTION COMPLETION, ACTIVATION AND IOC. THE ATCS REPRESENTS A RATHER SIZEABLE PROTION OF OUR REMAINING WORKLOAD. PROPOSALS TO COMPLETE THIS SYSTEM WILL GIVE US A MORE CONCRETE PROJECTION OF OUR FINANCIAL SITUATION AS WILL THE CONTRACTOR'S PROPOSAL FOR THE COST OF THE TIME EXTENSION TO THE COMPLETION OF THE CONSTRUCTION EFFORT. IF ALL GOES WELL, WE'LL HAVE THAT MAJOR ISSUE SETTLED BY DECEMBER. JULY 1984 WILL SEE THE COMPLETION FO THE SUBSYSTEMS INTEGRATION AND TESTING AS WELL AS CONSTRUCTION COMPLETION. FINALLY, THE COMPLETION OF SYSTEMS TESTING AND IOC ARE FORCASTED FOR SEPTEMBER 1985.

AS I SAID EARLIER, WE MADE OUR COST AND SCHEDULE PROJECTIONS TO COMPLETION OVER ONE YEAR AGO. WE STILL HAVE A LONG WAY TO GO, BUT WE SEEM TO HAVE STABILIZED OVER THIS PAST YEAR. WE GAIN NEW CONFIDENCE IN OUR PROJECTIONS AS EACH MILESTONE IS REACHED, AND AS THIS SLIDE DEPICTS, WE HAVE SOME MAJOR MILESTONES COMING UP SOON. WE ARE STILL CONFIDENT IN OUR PORJECTIONS AND WE WISH TO ASSURE THE COMMITTEE THAT WE ARE MAKING EVERY EFFORT TO COMPLETE THIS EFFORT WITHIN OUR ESTIMATE.

THANK YOU GENTLEMAN - THAT CONCLUDES THE BRIEFING.

ASTF FUNDING PROFILE

FISCAL YEAR	SOURCE	AMOUNT ($M)	STATUS
77	MILCON REQUEST	437.0	APPROVED
81	REPROGRAMMING	16.3	APPROVED
82	REPROGRAMMING	80.1	APPROVED
83	MILCON REQUEST	42.0	CONGRESSIONAL REVIEW
	TOTAL REQUIREMENT	575.4	

FY 83 MCP REQUEST

- TOTAL AMOUNT REQUESTED $42.0 MIL.
- PROGRAM AREAS TO BE FUNDED (NO NEW STARTS-FINAL FUNDING TO COMPLETE THESE EFFORTS):
  - CONTRACT CHANGES
  - CoE SUPERVISION & ADMINISTRATION
  - GOVERNMENT FURNISHED EQUIPMENT
  - TEST INSTRUMENTATION SYSTEM
  - AUTOMATIC TEST CONTROL SYSTEM
  - ARCH.-ENGR.
  - TECHNICAL STAFF
  - EQUIPMENT INTEGRATION
  - TENN. USE TAX
  - MGMT RESERVE

UPCOMING MILESTONES

- JUNE 1982
  - ATCS PROPOSALS
  - CONSTR CONTRACT TIME EXTENSION PROPOSALS
- AUGUST 1982
  - AWARD ATCS CONTRACT
- DECEMBER 1982
  - COMPLETE NEGOTIATIONS FOR TIME EXTENSION
- JULY 1984
  - COMPLETE SUBSYSTEMS INTEGRATION & TESTING
  - COMPLETE CONSTRUCTION CONTRACT
- SEPTEMBER 1985
  - COMPLETE SYSTEMS TESTING
  - INITIAL OPERATING CAPABILITY

The briefing on the Consolidated Space Operations Center which was to be presented by Maj Byrne is included in the transcript of Hearings before the Subcommitttee on Military Construction on Armed Services and Subcommittee on Military Construction of the Committee on Appropriations of the United States Senate on April 22, 1982.

CONCLUSION OF HEARING

Senator LAXALT. The subcommittee will stand in recess subject to the call of the Chair.

[Whereupon, at 11 a.m., Thursday, June 24, the hearing was concluded, and the subcommittee was recessed, subject to the call of the Chair.]

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